Adaptation of pastoralists to climate variability

The case of the Karrayu pastoralists' community in the Upper Awash Valley of Ethiopia

By

Dula Wakassa Duguma

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Department of Sociology and Human Geography

University of Oslo

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Declaration

I, Dula Wakassa Duguma, hereby declare that this thesis is my own original research work and has not been submitted for any degree award to any other University.

Dula Wakassa Duguma

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Oslo

Dedication

I dedicate this thesis to Karrayu pastoralists' community, with compassion!

Acknowledgement

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Abstract

The study has been conducted in the Upper Awash Valley of Ethiopia on the adaptation of the Karrayu pastoralists' community to climate variability and change. Pastoralists in Ethiopia are among the most socially, economically, politically and geographically marginalized groups. Recurrent drought is a perennial problem to them. The traditional coping and adaptation strategies of pastoralists in Ethiopia have become increasingly insufficient to sustain local livelihoods during times of drought. Although recurrent drought remains a constant threat, the vulnerability of pastoralist community must be explained with reference to much broader socio-economic, political and environmental issues. The purpose of the study is to understand the dynamics of vulnerability and how the Karrayu pastoralists' community became vulnerable to climate variability and how the community adapts to changes in climate related hazards, by examining and analyzing the roles of organizations in developing or destroying the adaptive capacity of the Karrayu pastoralists' community. Qualitative research method is used to address the objective of the research. Key informant interview, focus group discussion and observation techniques of qualitative data collection are used to generate the data. The study analyzes and explains the various forces that aggravate the vulnerability of the Karrayu pastoralists to climate variability and change based on the pressure and release model. It provides detail explanation on the adaptation and coping mechanisms the community, and the external responses by the government and nongovernmental organizations by using the institution, adaptation and livelihood framework. Government policy, development interventions, Awash National Park, population pressure, Lake Basaka, bush encroachment, and conflict are the main forces that aggravate the vulnerability of the Karrayu pastoralists to climate variability and change. The Karrayu pastoralists are also pro-actively responding to their vulnerability by taking different adaptation and coping mechanisms. The adaptation systems that they have use in the past have become insufficient to sustain the Karrayu pastoralists and is changing gradually, their milk and meat consumption is decreasing, their mobility is restricted, their traditional support system has weakened, and they lost different fruits of plants that they used to eat from the riverine forests. Instead, different forms of adaptation are emerging. These include diversification by shifting their livestock composition from cattle to camel and goat, and different income diversification techniques, opportunistic farming, irrigation, and dividing their household in to mobile camel household and settled household. In response to the vulnerability of the pastoralists' to climate variability and change, the government is conducting irrigation project to develop the adaptive capacity of the Karrayu community, which is part of the Climate Change National Adaptation Programme of Action.

Key words: Karrayu pastoralists, adaptation, vulnerability, irrigation, diversification

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List of Abbreviations

AVA	Awash Valley Authority
CRDA	Christian Relief and Development Association
CSA	Ethiopian Central Statistical Agency
CSO	Civil Service Organizations
DA	Development Agents
FAO	United Nations Food and Agricultural Organization
GDP	Growth Domestic Product
GTF	Gudina Tumsa Foundation
HVA	The Dutch firm Handels Vereniging Amsterdam
INGO	International Nongovernmental Organization
IPCC	Intergovernmental Panel on Climate Change
MAADE	Middle Awash Agricultural Development Enterprise
MFA	Ethiopian Ministry of Foreign Affairs
MoFED	Ethiopian Ministry of Finance and Economic Development
NAPA	Climate Change National Adaptation Program of Action
NGO	Nongovernmental Organization
PA	Pastoral Associations
PAR	Pressure and Release Model
PCDP	Pastoralist Commission Development Programme
PSNP	Productive Safety Net Programme
SREX	Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WFP	United Nations World Food Programme

1. Introduction

1.1 Background

The world's poor people are disproportionately vulnerable to loss of livelihood and assets, dislocation, hunger, and famine in the face of climate variability and change (Anderson *et al.* 2010). Some of the most vulnerable households are in communities and countries that have the weakest institutional capacity and the fewest resources to respond (Helteberg *et al*. 2010). Developing countries have low capacity to respond to climate change, and poorest people in these countries are most vulnerable to climate variability and change. While climate variability and change strongly affect both pastoralists and crop farmers, the impacts are higher on the pastoralists. This study aims to understand the dynamics of vulnerability and how the Karrayu pastoralists' community became vulnerable to climate variability and how the community adapts to changes in climate related hazards, by examining and analyzing the roles of organizations in developing or destroying the adaptive capacity of the Karrayu pastoralist community.

Climate variability characterized as spatial and temporal occurrence of climate anomalies such as drought, flood, cyclones and variations in rainfall and temperature are a normal phenomenon in weather systems. However, climatic variability, in conjunction with other physical, social, and political-economic factors, is currently a major problem in semi-arid regions (Robit *et al*. 1996). Human beings have been adapting to the variable climate around them for thousands of years. Worldwide local climate variability can influence peoples' decisions with consequences for their social, economic, political and personal conditions, and effects on their lives and livelihoods (Boko *et al*. 2007). Many people in the world structure their lives in concert with their environmental contexts. For various reasons associated with climate, people can become vulnerable, that is, they are at a high risk of negative outcomes as a result of climatic events that overwhelm the adaptations they have in place. Vulnerability to environmental changes occurs due to variation in frequency or duration of those changes or because people are constrained economically, socially or politically from responding adequately to those changes (Smithers and Smit 1997, UNFCCC 2007).

It is widely noted that vulnerability to environmental change does not exist in isolation from the wider political economy of resources use. Vulnerability is driven by inadvertent or deliberate human action that reinforces self-interest and the distribution of power, in addition to interacting with physical and ecological systems (Ribot 2010). Changing environmental

conditions may be important, but it is the convergence of multiple processes (such as social, economic, political, historical, and cultural) within a particular context that drives change and creates and perpetuates vulnerability (O'Brien 2010). Vulnerability is defined as the characteristics of individuals or groups in terms of their capacity to anticipate, cope with, resist and recover from the impacts of environmental change (Wisner *et al.* 2004). Human beings have been responding pro-actively and developing an adaptation strategy to overcome their vulnerability. Adaptation and coping strategies are interlinked so that the way households cope with crises either may enhance or may constrain their future coping strategies, as well as their possibility to adapt in the long term (Anderson *et al*. 2010).

Developing countries are dependent on climatic resources and because of growing populations and lower technological capabilities, they generally are considered to have lower adaptive capacity (Adger and Kelly 1999). There are also economic factors (like income), livelihood systems (which are based on natural resources like pastoralism) and political factors that contribute to lower adaptive capacity. This is especially true for pastoral people in Africa, who inhabit the arid and semi-arid regions with high climate variability. According to the recent Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) by IPCC (2012), pastoral livelihoods in the dryland areas are highly likely to suffer from more variability and frequent occurrences of extremes. This special report on extremes underscores the fact that climate change will have an impact on climate variability and extreme events occurrence. The same report, however, indicates that not all extreme events necessarily cause extreme impacts; instead a combination of other underlying factors (socio-economic, political, and physical) can amplify the negative impacts (IPCC 2012). This implies that vulnerability to climate change does not occur in isolation of other underlying factors, instead socio-economic and environmental conditions shaped by political and global economic processes occurring simultaneously influence the ability of a community or social group or individual to respond to climate related hazards (Kelly and Adger 2000, O'Brien *et al.* 2004, Smit and Wandel 2006).

Most pastoral adaptations to climate variability are socio-cultural (that is, they involve changes in management or practices), usually a series of reactive responses to climate events such as drought (Galvin *et al.* 2004). Africa is already a continent under pressure from climate stresses and is highly vulnerable to the impacts of climate change. Many areas in Africa are recognized as having climates that are among the most variable in the world on seasonal and decadal time scales (Boko *et al.* 2007, UNFCCC 2007). It is indicated that the most important impacts of climate change on poor and vulnerable people are greater variability in

temperatures and precipitation over time and across space and the impacts of such variability across asset types and households. With increasing climate variability, development interventions that do not attend to vulnerability, adaptive capacity and resilience may worsen the circumstances of those they seek to benefit (Agrawal 2010).

Ethiopia is the third most populous country in Africa, with a very weak economy and fragile agro- ecological conditions. The country's heavy dependence on rain-fed and subsistence agriculture increases its vulnerability to adverse effects of climate change (World Bank 2010). Over the past several decades, the country has been hit by repeated droughts, famine and epidemics that may be relate to changing climate conditions (Amsalu and Adem 2009). The Ethiopian lowlands are particularly affected by these problems, which have been occurring recurrently. The people in the lowlands are among the most resource deprived and the most geographically and politically marginalized. Hence, the magnitude and impact of hazards in these areas has been intensifying.

1.2 Statement of the problem

More than 60 percent of Ethiopia's territory in the arid and semi-arid lowlands is inhabited by nomadic pastoralists (Markakis 2004) who have increasingly come under pressure from various sides since the second half of the twentieth century due to: processes of sedenterization, population increase, impoverishment and expropriation of higher potential land by governments and marginal farmers[1], and processes by government and development agencies to change the basis of traditional rights in land (Hogg 1992); national incorporation and market integration, and local and regional conflicts (Markakis 2004); extreme climatic fluctuations, animal diseases, over estimation of the grazing capacity, land-use changes and the demand from an increasingly important cash-based economy (Abule *et al.* 2005); and conflict and large irrigation schemes (Muller-Mahn *et al.* 2010). In relation to the Ethiopian highlands, pastoralists inhabit the lowland periphery which encircles the highlands. Because of their remoteness and distance from major population centres, infrastructure and communication are generally poorly developed.

Pastoralists in Ethiopia like other elsewhere in Africa are among the most socially, economically, politically and geographically marginalized groups (Hogg 1997). Different authors indicated that there is no smooth relationship between pastoralists and the Ethiopian central government (Hogg 1997, Devereux 2010, and Muller-Mahn *et al.* 2010). The deeply

[1] Marginal farmers refer to those farmers who are living on the margins of the Karrayu pastoralist territory and expanding their farm towards the grazing land of the Karrayu pastoralist community. They are marginal both in relation to the farming community and the Karrayu pastoralists.

disturbed relations between pastoralists and the state have their roots in a long history of governmental interventions and policies that failed to acknowledge pastoralism as a viable way of life (Devereux, 2010). Despite significance improvement in the understanding of pastoralism and the environmental characteristics of arid and semi-arid areas since early 1990s (Scoones 1999), many government officials still view pastoralism as a "backward" culture; they believe that pastoral production systems need to be transformed so that pastoralists become "civilised" citizens contributing to the national economy (Muller-Mahn *et al.* 2010). The relationship between pastoralists and the Ethiopian centre has therefore often been ambivalent at best, and at worst openly hostile (Hogg 1997).

The Karrayu pastoral community inhabits the south-eastern lowland areas of the country. Owing to the physical geography of the region they inhabit, the subsistence base of the Karrayu is heavily dependent on nomadic pastoralism and exploitation of natural resources, marked by spatial and seasonal variations (Gebre 2009). This means of subsistence is highly based on climate dependent natural resources. This increases their sensitivity and exposure to climate variability and change induced impacts. Recurrent drought and conflict over natural resources between the Karrayu pastoralist community and other pastoral community and agro-pastoralists are common.

Different scholars argue that recurrent drought is the key factor that causes vulnerability of pastoralists in Ethiopia (Kloos 1982, Hogg 1997, Helland 2006, Feinstien International Center 2007, and Ruijs *et al.* 2011). Although recurrent drought remains a constant threat, the vulnerability of pastoral communities must be explained with reference to a much broader socio-economic, political and environmental issues. In addition to this, Muller-Mahn *et al.* (2010) indicted that the traditional coping strategies of pastoralists in Ethiopia have become increasingly insufficient to sustain local livelihoods during times of drought. Owing to the above mentioned problems, the issue of adaptation is unquestionable as far as the Karrayu pastoralist community living there. The aim of this study is to understand the vulnerability of Karrayu pastoralists' community, their adaptation mechanisms and the role of organizations in developing or destroying the adaptive capacity of the community. Hence, the following objective and research questions are prepared to clearly understand the problems stated above, with a focus on the Karrayu pastoralists community.

1.3 Objective

The objective of the study is to understand the different factors that aggravate the vulnerability of the Karrayu pastoralists to climate variability and how their vulnerability is

changing, and what are the adaptation mechanisms and responses of government and nongovernmental organizations in order to develop the adaptive capacity and improve the survival and well being of the community.

1.4 Research questions

1. What are the socio-economic conditions that create vulnerability to climate variability, and how does the community cope with or adapt to it and how is this changing?

2. What are the roles of government institution and non-governmental organizations in developing or destroying the adaptive capacity of the Karrayu pastoral community and how has their involvement affected the community?

1.5 Significance of the study

As discussed above, in Ethiopia, where more than 60 percent of its territory is arid and semi-arid lowland occupied by pastoralists, it is indicated that pastoralists have come under increasing pressure and their traditional coping and adaptation strategies have become insufficient to sustain their livelihoods. This case study is important in showing whether there is a future for Karrayu pastoralists in pastoralism as an adaptation strategy to climate variability and change, by analyzing different factors that aggravate their vulnerability and the responses taken to reduce their vulnerability. What this study will show is that how the vulnerability of the Karrayu pastoralists is changing and what new types of adaptation mechanisms are emerging. It will also consider some of the implications of the findings, including the cultural consequences.

1.6 Outline of the thesis

In this thesis I look at the various forces that make the Karrayu pastoralists more vulnerable to climate variability and change and how they are adapting to it, by examining the roles of institutions in developing or destroying the adaptive capacity of the community. The thesis is structured in to seven sections. This first chapter is an introduction that provides background information on the topic, presents statement of the problem, research questions, and significance of the study.

The second chapter provides a clear review on vulnerability and adaptation in relation to pastoralists in general, and specifically to Ethiopian pastoralists. It also provides a detailed background of Karrayu pastoralists" in terms of their traditional institution, agro-ecological setting and socio-economic activity, so that the reader can get a better understanding of the

study area. The third chapter consists of the conceptual framework that this thesis is draws up on, including two analytical frameworks: Pressure and Release model and Institution, adaptation, and livelihood framework. The fourth chapter explains the methods used to conduct the research, including data collection and ethical considerations.

The analysis part of the thesis is divided in to two chapters. Chapter five consists of the first part of analysis, where forces (factors) that aggravate vulnerability have been analyzed by using the Pressure and Release model. This chapter also discusses the adaptation and coping mechanisms the community use to decrease their vulnerability. Chapter six consists of the second part of analysis, where the external response taken by government institution and non-governmental organizations in order to develop the adaptive capacity of the community has been analyzed by using the Institution, Adaptation and Livelihood framework. The last chapter is conclusion, which provides the findings and considers the implications of the findings for the Karrayu pastoralists.

2. Literature Review and conceptual framework

2.1 Climate variability and pastoralists in Ethiopia

Although climate change is a global phenomena, its effect varies from place to place and also in time scale (Christensen *et al.* 2007). Likewise, the vulnerability to climate change significantly varies across geographical area and livelihood system determined by various factors such as the extent of exposure, sensitivity and adaptive capacity (Brooks and Adger 2003, Eriksen *et al.* 2008). Dryland regions are characterized by high rainfall variability and uneven resource distribution (Scoones 1995). Pastoralism as the major livelihood system in this region, particularly in arid and semi-arid regions of Africa has evolved in response to such variability and able to cope, adapt, and live with such uncertainties (Markakis 2004). This condition is true in case of pastoralists in Ethiopia. As indicated in Figure 1 below, pastoralists in Ethiopia inhabit the dryland areas in the periphery of the country where rainfall is highly variable.

In arid and semi-arid areas where rainfall is highly variable and unpredictably, the influence of climate variability on the livelihood system is very significant. Pastorlism, the major livelihood system, in most of arid and semi-arid areas of the Horn Africa in general, and specifically in the lowland arid and semi-arid areas of Ethiopia have been developed in response to such variability as an adaptation strategy to prevent and mange the risk of climate related disaster (e.g. drought). However, in the last 2-3 decades the vulnerability of pastoralists to drought has been increasing in sub-Sharan Africa particularly in the Horn.

East Africa is home to thousands of pastoralists who herd their livestock in the semi-arid to arid areas of the region. Rainfall seasonality affects forage availability, livestock production and ultimately the livelihoods of these people. East African rainfall is bimodal, but is characterized by uncertainty both spatially and temporally (Galvin *et al.* 2004). With regard to this, Ruijs *et al.* (2011) reveals that the north- and south-eastern parts of Ethiopia are facing lower rainfall and higher temperature levels than the rest of the country. Citing the National Meteorological Agency of Ethiopia, they point out that climate variability is mainly manifested through the variability and decreasing trend in rainfall and increasing trend in temperature as observed in the last decades. The major climate hazards observed in Ethiopia include drought, flood, and livestock and human diseases. Although flood is more a lowland phenomenon, it is noted that flood in the lowlands are partly attributable to anthropogenic factors (human actions) such as irrigations, dam construction, farming and other activities implemented in the upstream of the river basin.

Generally, due to the varying rainfall and temperature patterns, the arid, semi-arid and sub-humid lowlands are more vulnerable than the highland areas (Ruijs *et al.* 2011). As a result, pastoral people inhabiting this part of the country (the Afar, the Karrayu and the Somali pastoralists of Ethiopia) have suffered frequently from climate related hazards, particularly drought. Hence, the more erratic and the lower rainfall levels, the higher the vulnerability of these pastoralists to climate variability and change.

2.1.1 Pastoralism and pastoral population

Pastoralism is defined as the "unsettled and non-commercial husbandry of domestic animals" (Le Houerou cited in Robit *et al.* 1996). Le Houerou estimates a pastoralist population of 60 to 70 million people in 1985, mainly in Africa and Asia. Robit *et al.* (1996) points out that pastoralism is "*essentially - but not solely - a form of adaptation of human societies to hazards and hardships induced, and imposed on them, by climatic constraints*". The keeping of livestock is the principal substance strategy of many people inhabiting the developing world's arid and semi-arid lands. In Africa, it has been estimated that between 20-40 million agro-pastoralist and pastoralist people depend on livestock as their major source of food and money (Gebremichael *et al.* 2010). The estimates for the pastoral population in Ethiopia vary. Where more than 60 per cent of Ethiopia's territory in the arid and semi-arid lowlands is inhabited by nomadic pastoralists (Gebremichael *et al.* 2010, Markakis 2004), Gebremichael *et al.* estimates that 12-15 million pastoralist people are thought to live in these areas; whereas Virtanen and Gemechu (2011) writes that pastoralism provides the main livelihood for close to 15 million people spread across seven regions of the country.

Although pastoralists in Ethiopia occupy the remote arid and semi-arid lowlands which are generally poorly developed in terms of communication and infrastructure, livestock marketing in pastoral areas contributes significantly to national economies, although it is often undervalued. In Ethiopia, 45 per cent of GDP is generated by the agricultural sector, a third of which is provided by livestock industries and much of this is vested in the pastoral areas, including 40 per cent of the country's cattle and 75 per cent of goats (Hogg 1997). A significant recent change in all of Ethiopia's pastoral areas, which includes the Afar, the Borana, the Karrayu, the Omo and the Somali pastoralists, is the growth of livestock marketing and the growing vulnerability of pastoralists to volatile terms of trade (Helland 1997, Davies and Bennet 2007).

Affected by unpredictable climatic conditions, recurrent conflicts and a generally inhospitable environment, the pastoralists are among the poorest of the poor (Virtanen and

Gemechu 2011) in terms of disposable income, access to social services and general welfare. Human development indicators and poverty rates among pastoralists are uniformly worse than non-pastoralists in Ethiopia. It is indicated that health coverage is sparse, with only 10 percent of the population immunized and more than 90 percent living in malaria-infested areas. In terms of education, both primary and secondary levels of enrolment remain at 20 percent and 3 percent, respectively (Virtanen and Gemechu 2011). The unpredictable climate, coupled with low levels of human development, mean that the expected effects of climate variability and change are likely to exacerbate the problems of development in pastoral regions.

2.1.2 Pastoralists and vulnerability

The pastoral communities now seem to have become more vulnerable than they used to be (Helland 2006). It is argued that recurrent drought is the key factor which causes vulnerability of pastoralists in Ethiopia (Kloos 1982, Hogg 1997, Helland 2006, Feinstien International Center 2007, and Ruijs *et al.* 2011). While opinions vary on the severity and frequency of drought during the last ten years or so, the report by Feinstien International Center (2007) indicates that drought continues to cause excessive loss of pastoral livestock, causes severe hardship to pastoralists and leads to repeated bouts of humanitarian assistance. Aid assistance during drought was first delivered to pastoral areas of Ethiopia in the early 1970s and since then, the dominant response has been food aid (Feinstien International Center 2007). But while aid may have helped to keep pastoralists alive, they remain highly vulnerable. Climate variation remains a perennial problem to pastoralists; hence their vulnerability has to be explained with reference to a much broader set of issues. Government policies and socio-economic factors are also contributing their part. Hogg (1997) writes that the situation of Ethiopia's pastoralists is now increasingly characterized by poverty, poor food security and increasing environmental risk as well as political, economic and social marginalization.

In their study in Ethiopia, Ruijs *et al.* (2011) compared the vulnerability of communities in the highland villages and lowland villages. They identified that there is a clear difference in the level of vulnerability, and households in the lowland villages are more vulnerable to climate shocks than those in the mid- and highlands. In the lowlands, exposure to drought risk is higher and coping capacities are more limited due to their large household size and low levels of income diversification and education whereas high erosion makes the highlands sensitive to climate variability. For all villages, drought is the main climate hazard. They added that, not all hazards, however, are directly related to climate. High food prices, soil erosion and animal diseases are important as well. Similarly, the World Bank also

reported that, in the Ethiopian context, the farming community is the most vulnerable because of its high dependence on agriculture for its livelihood. Even within the farming community, small-scale subsistence farmers and pastoralists are particularly vulnerable to climate change related hazards like drought; these hazards include shortage of food and water for humans and livestock, and diseases (World Bank 2010).

2.1.3 Pastoralists and adaptation

Pastoral adaptations in the lowlands of Ethiopia depend entirely on access to wide tracts of land to make full use of a resource base that is generally poor and unevenly distributed (Helland 2006). Mobility of pastoral and semi-pastoral communities is part of their climate change adaptation and herd management strategies. Mobility is the basis of the traditional coping strategy, based on opportunistic movements within and across geographically distributed grazing units, which are composed of those households that depend on common permanent water sources (Angassa and Oba 2008). It is perhaps the most common and seemingly natural response to environmental risks which pools and distributes risks across space, and is "especially successful in combination with clear information about the spatial and temporal distribution of precipitation" (Agrawal 2010).

In the culture of Ethiopian pastoralists, the grazing units consist of semi-sedentary camps where the elderly, women, and children stay with dairy cows or lactating animals. The surplus herd, composed of dry cows, heifers, and male animals, join the mobile herd management unit herded by young men on more remote grazing lands. Rangeland rotation during the wet and dry seasons traditionally prevented overgrazing, while controlled access to water provided the key mechanism for guaranteeing sustainable use of the grazing lands (Desta and Coppok 2004, Angassa and Oba 2008). Similarly, Agrawal (2010) argues that mobility is a way of life for large groups of people in semiarid regions, and a long-standing mechanism to deal with spatiotemporal variations in rainfall and range productivity; and hence the status of the social group in question matters whether mobility is the desirable adaptation or not.

The main contemporary problem in Ethiopian pastoral societies, however, is that various indigenous forms of communal land tenure that evolved as adaptation strategy for pastoralists for their mobility are now increasingly subordinated to uniform national rural land tenure legislation. Helland (2006) writes that initiatives and reforms within Ethiopian land tenure legislation at the national level are formulated on the basis of issues relevant primarily to the arable agriculture in the highlands. The situation in the pastoral areas is either ignored

or very superficially treated. It is noted that interventions that restrict the mobility of pastoralists will make them more vulnerable to climate change effects. Hence, ensuring the group or community land and environmental rights, support for local institutions and indigenous knowledge, and conflict resolution mechanisms strengthen the resilience of pastoral systems to climate change related hazards (World Bank 2010).

There are also indications that pastoralists are caught in a dilemma. On the one hand, the pressure to cope with and adapt to a multitude of changes has never been as high as today; whereas on the other hand, recent developments have led to reductions in spatial mobility, which have weakened the sustainability and resilience of traditional forms of pastoral production systems (Muller-Mahn *et al.* 2010). Under these conditions, pastoralists are challenged to modify their livelihoods according to the ongoing changes, to search for new alternative strategies, to diversify their livelihoods and at the same time to maintain their adaptive capacities with regard to future changes (Galvin 2009). Similarly, Muller-Mahn *et al.* (2010) indicated that in conditions where traditional coping and adaptation strategies have become increasingly insufficient to sustain the local livelihoods, the state obviously played and still plays a crucial role in changing livelihood strategies and the emergence of new development pathways. The question is whose interests are ultimately decisive for shaping these pathways, and to what extent the pastoralists are able to actively participate in this process.

2.2 The Karrayu pastoralists (the study area)

The Karrayu are transhumant pastoralists located in eastern lowland arid and semi-arid part of the country and inhabit the Matahara plain and the surrounding of Mount Fantalle, in the Upper Awash River Basin. In the current national administrative structure, karrayuland comes entirely within Fantalle district of East Shewa Zone of Oromia Regional State, as indicated in Figure 1 below. The administrative town of the district, Matahara town, is located at about 197 km from the capital city (Addis Ababa) and 98 km from Adama town, capital of East Shewa Zone. There are about 18 rural *kebeles*[2] (pastoral associations) administrative units in Fantalle district. The neighbours of the Karrayu are the Afar in the north and north-east, the Arsi Oromo in the south, the Ittu Oromo in the south-east, and the Argoba in the north-west. The Afar and Argoba are pastoralists, whereas the Arsi and Ittu are agro-pastoralists.

[2] Kebele refers to the smallest administrative unit of the government, where different Kebeles together make up the District. Districts make up Zones. Zones of a region, based on ethnicity, make up Regional government. Different regional governments make the Federal Government of Ethiopia.

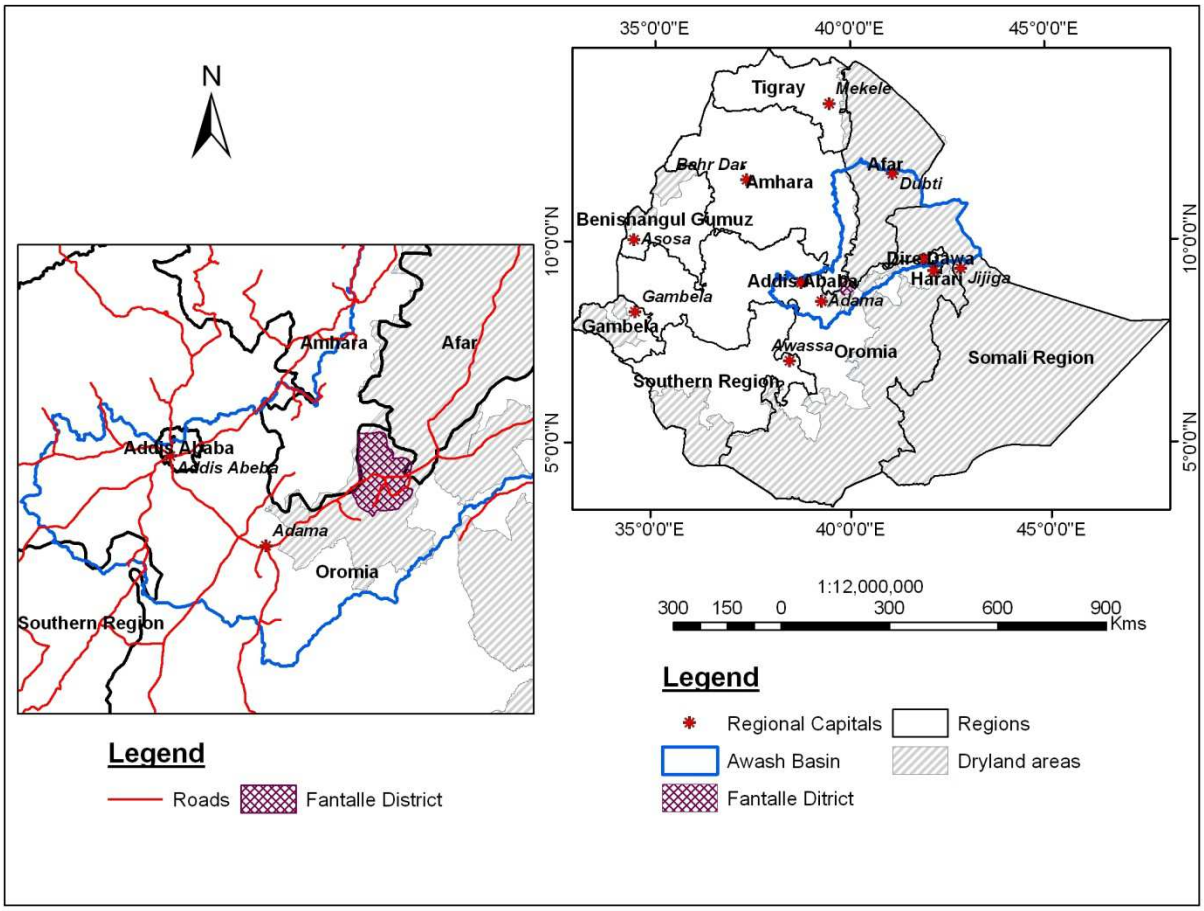

Figure 1. Map of the study area and dryland areas in Ethiopia (Data source: CSA 2008; mapped by the Author).

With regard to population, Gebre writes that according to the 1994 national census, the size of population is reported to be 55 853, which figure includes both local Karrayu inhabitants and Ittu migrants who have come to live here over the last forty years (Gebre 2009). The current population and housing census of the country released in 2008 indicate that there are 47, 396 female and 42, 719 male inhabitants accounting for a total of 90,115 populations in Fantalle district. Similarly in Fantalle town alone, there are 11, 277 male and 11, 089 female inhabitants together accounting for 22, 366 total population of the town (Central Statistical Agency 2008).

2.2.1 Local institution

The pastoral institutions are instrumental in managing and facilitating mobility and natural resource management. Pastoral institutions also play a key role in enhancing coping capacity

during crises through mobilizing resources as social support mechanism. *Gadaa*[3] system is one such typical example of pastoral institutions. There is a large body of knowledge and experience within local communities on coping with climatic variability and extreme weather events. Local communities have always aimed to adapt to variations in their climate (UNFCCC 2007). For instance the Borana and Karrayu pastoralists of Ethiopia, who are still practicing the *Gadaa* system, have their own culture to predict the coming season, either to prepare for coping mechanisms for the coming drought or to enjoy the coming wet season. One mechanism they used to know it among other things is by looking at the character their livestock show (especially cows). In this section, my intention is not to introduce the complex and vast *Gadaa* system institution; rather it is to introduce how the Karrayu community who still practice *Gadaa* system support themselves under this traditional institution to adapt to the changing environment, specifically to climate change and variability.

The *Gadaa* system brings every individual Karrayu under one umbrella, avoiding clan and local identities. There are two moiety structures from which other sub-clans trace their lineage in Karrayu society, named *Dullacha* and *Baso* major clans. Each of these was again divided into sub-sub-sub clans. Even though there is a sort of classification based on clan sub-divisions, the Karrayu pastoral community is seen as a group of people having highly cohesive and strong social organization in the area. The clan conglomerations of the Karrayu pastoral community in Fantalle district play a major role in administering the community and the resources in the area through its different levels of social organizations.

Regarding leadership in the system of the clan, in most cases an individual's personality, talent, ability to persuade people and reputation within the society in terms of resolving conflicts and general performance in the community determines an elder's position as a leader of a sub-clan or a more inclusive clan. When issues come to the interest of the whole Karrayu and involve their identity as "being a Karrayu" elders from the two major clans, *Dullacha* and *Baso*, come together and act as a single entity. For example, when the Karrayu deal with non-Karrayu groups like the *Afar* and *Argoba*, the renowned elders from each major clan, *Dulacha* and *Baso*, handle the case, and acct as representatives of the interest of the entire Karrayu.

The leader of the clan keeps the peace and the welfare of the clan; defends the rights of the poor, the weak and widows; protect individuals from discrimination and injustice. In

[3] *Gadaa* is Oromo social organization in which five classes alternate in taking political, socio-economic as well as ritual responsibility every eight years. It takes forty years for a class to assume such a responsibility for a second time.

addition, the leader calls upon the elders to reconcile disputants. The leader also looks after the appropriate practices and integrity of household, individual and group herding management practices. In addition, the leader is responsible to bring the head of a household to a charge if he does not care for the wellbeing of his family; if he does not cloth his wife/wives and children. Moreover, if a household or an individual lost his livestock (especially cattle and camel) due to robbery, accident (like drought) or war/conflict to the non-Karrayu, the leader of the clan calls up on the members of the clan to explain the issue happened to the household or the individual, and the members of the clan contribute live animals (cattle, camel, sheep, or goat) for the household or individual who lost the property. In this way, the household or the individual gets overnight his property from the clan.

The traditional institution of the Karrayu governs and involves in almost all aspects of the life of the Karrayu pastoralist community in Fantalle district. The social, spiritual, economic and political life of the Karrayu is ensured and safeguarded through the traditional system they developed and led by for years.

The *Gadaa* institution is now being threatened mainly due to the decrease in resource to celebrate *Gadaa*, introduction of sedentary form of life (due to government settlement program), the expansion of Islam and the occupation of some of the ritual ceremonial grounds by alien groups to the Karrayu.

2.2.2 Agro-ecology

The study area has a flat topography, mainly extensive plain land and is situated along the Awash River. Awash River is the main and the largest water body in this arid and semi-arid area with its source in central highlands of the country and flows until the border of Djibouti where it ends in Lake Abe. The area lies at an altitude of not more than 1000meters above sea level, falling to 950meters at Matahara plain and rising as high as 2007 meters at Mount Fantalle, which is the highest elevation in the region. The area is covered by bushy-wooded grass land, the dominant vegetation being acacia species which is characterized as open to denser shrub and bushes. Mount Fantalle, lake Basaka and rocky land (lava rock outcrop) are some topographic land features describing the area.

The study area falls within the traditional *Kolla* (hot and dry) agro-climatic zone, which can be classified as semi-arid tropical lowland climate. According to climatic classification developed in the Agro-ecological Zones of Ethiopia (Ministry of Agriculture 1998), the study area has a warm to hot thermal zone and semi-arid moisture zone with yearly maximum temperature range from 32 to 42 degree centigrade while the minimum temperature

ranges from 10 to 22 degree centigrade. The rainfall in the study area is erratic, scarce, and occurs for short period and with high intensity, and it is usually common to have a flood with only few minutes of rainfall. The main rainfall season, which accounts for the largest total rainfall of the year occurs from July to September, and this season is locally termed as *Ganna* (which means main rainy season in *Afaan* Oromo). The other rainfall regime, called *Arfasa*, occurs in March and April. This one is very important for the Karrayu pastoralists in particular, since it comes at the point when herds and human are exhausted by the long dry season.

The study conducted by Booker Tate (2005) sponsored by Matahara sugar factory indicated that there are three main soil groups (shallow soils, pumice soils, and alluvial soils) in the area. The report stated that the soils are generally light textured, alkaline in pH, contain high calcium in the exchange complex and have high cation exchange capacity (CEC). Except in the shallow soils, varying degree of salinity and sodicity has been observed. These soils were identified according to FAO classification system (FAO 1984) of soils for Ethiopia as Leptosols (shallow soils), Cambisols (soils with only a moderate degree of profile development) and Solonetz (poorly structured sodic clay soils).

2.2.3 Socio-economic activity

Karrayu community way of life has predominantly been nomadic pastoralism which is heavily dependent on environmental resources whose availability is determined by temporal and spatial variables. The Karrayu are still practicing pastoralism raring their livestock which mainly include cattle, goat, sheep, and camel, even though there are some indications of shift towards agro-pastoralism due to different external factors. Gebre (2009) writes that farming system to some extent appears to be clan specific, in which the majority of the Karrayu clan has been engaged in pastoral way of life, while the Ittu are mostly agro-pastoralists.

Edjeta (2006) also point out that cultivation was not socially appreciated in Karrayu community. Among the Karrayu, there had been (and it is still so among those Karrayu who are alien to farming practice) a sort of filial reverence to the Earth which is deemed too sacred to be pierced by hoe or the plough. According to the same writer, the taboo is stricter for men than for women to dig a ground. The men also regarded the digging of the soil as "womanish" work.

Another major socio-economic activity of the Karrayu pastoralists is livestock market. The major market in the area is Matahara market, which is a weekly market every Thursday, where goat, sheep, and camel are sold, as well as the community buy cereals. It is the major

livestock market for the Karrayu pastoralists around Matahara town in Fantalle district. In addition to these, there is a large market at a distance of 100km at Adama town, which is the capital of the Zone. Usually, the Karrayu pastoralists sale sheep and goat for smaller consumption which is more appropriate economically as well as technically than selling cattle. The Karrayu say that "sheep and goat are like money in a pocket". It is obvious that cattle fetch more money than smaller stocks but selling them for household's smaller cash needs is not economically viable.

This chapter has introduced the condition under which pastoralists are conducting their livelihood under the issue of climate variability. It discussed their vulnerability and adaptation mechanisms in which they are conducting their livelihoods. It briefly described the Karrayu pastoralists' community in terms of their traditional institutions, their agro-ecological settings, and socio-economic conditions which are used to understand the context in which the fieldwork has been carried out. This is important to understand both the findings and implications of these for the Karrayu pastoralists' community.

3. Conceptual framework

Geographers have made important contributions to natural hazard and vulnerability research primarily by contributing to the understanding of human interrelations with the environment (Hewitt cited in Rubio 2007). This interaction of environmental and social forces determines vulnerability, and its elements of exposure and sensitivity, and various social, cultural, political and economic forces shape adaptive capacity (Smit and Wandel 2006). It is important to recognize that research on the impacts of climate variability and change draw up on a diversity of theoretical and conceptual frameworks that reflect different understandings of vulnerability.

For instance, according to the Nested Hierarchy Model of Vulnerability developed by Smit and Wandel (2006) to analyze adaptation, adaptive capacity and vulnerability, adaptation is more local than vulnerability, and the elements of vulnerability - exposure and sensitivity - are determined by broader forces and stresses and shape adaptive capacity at local or community level. These authors have focused on the linkage between adaptation, adaptive capacity and vulnerability. Cutter *et al.* (2003) have analyzed vulnerability to environmental hazards by using Factor Analytic Approach to construct social vulnerability index to environmental hazard with socio-economic and demographic data. Whereas, another vulnerability analysis by Bitima *et al.* (2008) in their study of vulnerability of Mongolia's pastoralists to climate change, have only used climate data to examine the impacts of a drying climate and severe weather events on grassland productivity, livestock and livelihoods, and to develop maps of current vulnerability to climate extremes. For this reason, it is important to discuss how these concepts are interpreted in this thesis.

The concept of vulnerability is discussed by different scholars, and it is linked to negative or adverse consequences. Robit *et al.* (1996) writes that vulnerability is specific (in that it is concerned with a particular consequence, such as famine, hunger or economic loss), relative (in that it is a scale of the relative likelihood of different socioeconomic groups and geographic regions experiencing negative consequences, such as hunger, famine, economic loss or the loss of productive assets), and is a function of the relative status of socio-economic groups (such as income, clan, political party, livelihood, ethnicity, family, gender and age). Similarly, Eriksen *et al.* (2008) argues that vulnerability can be attributed to a set of risks that is broader than climate change alone such as conflict, disease outbreaks, economic degradation and other “creeping” factors are additional sources of vulnerability. These same authors also added that vulnerability to climate change is differential- in the sense that it is

context specific in relation to location, sector, state, or social group due to differences in the set of social and environmental conditions, as well as the set of stressors to which each are exposed (Eriksen *et al*. 2008).

In the Intergovernmental Panel on Climate Change Third Assessment Report, Schneider *et al.* (2007) defines the concept of vulnerability as "*the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.*" It is also indicated that vulnerability is composed of exposure to risk, sensitivity to that risk and adaptive capacity. Exposure refers to the external stress to people or communities, which is caused by e.g. changes in rainfall and temperature patterns due to climate change; whereas sensitivity refers to the extent to which households are affected by exposure to the stress (Ruijs *et al.* 2011).

Adaptation in the context of climate change refers to any adjustment that takes place in natural or human systems in response to actual or expected impacts of climate change, aimed at moderating harm or exploiting beneficial opportunities (Klein *et al.* 2005, Adger *et al*. 2007). Klein *et al.* (2005) also argues that adaptation is not a new activity only relevant in the context of climate change, but instead an ongoing process to reduce vulnerability to climate variability as well as human-induced climate change. It is also indicated that adaptation is closely linked to adaptive capacity (Anderson *et al.* 2010).

The concept of adaptive capacity has been introduced, reflecting an awareness that the mere existence of adaptation options does not mean that every vulnerable community, sector or country has access to these options or is in a position to implement them (Smit and Pilifosova 2001). According to the Adger *et al.* (2007) in IPCC report, the concept of adaptability (or adaptive capacity) is defined as "*the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences."* In this sense, Macchi (2008) argues that the adaptive capacity of a human-environmental system is therefore the potential of this system to reduce its vulnerability and consequently to moderate the potential impacts of climate variability and change.

As discussed above, vulnerability has many dimensions: economic, social, and political. This thesis does not focus on vulnerability that is caused due to drought, although I understand that drought is one of the key factors that cause vulnerability to climate variability as many scholars argued. But rather the focus of my thesis is on the various forces that made

the Karrayu pastoralists more vulnerable to climate variability and change and how they are adapting to it, by examining the roles of institutions in developing or destroying the adaptive capacity of the community. Hence, the following two analytical frameworks are used: the Pressure and Release (PAR) model, and Institution, Adaptation and Livelihood framework. These two analytical frameworks are used in order to address my two research questions. The PAR model is used to analyze the forces that cause and/or aggravate the vulnerability Karrayu pastoralists; whereas the Institution, Adaptation and Livelihood framework is used to analyze the adaptation strategy the community used in response to their vulnerability, and the roles government institutions and nongovernmental organizations play in developing or destroying the adaptive capacity of the community. The factors (forces) that aggravate or generate vulnerability have been analyzed in detail first by PAR model, and then it is linked to the Institution, Adaptation and Livelihood framework, as vulnerability is one component in the later framework.

3.1. Pressure and Release (PAR) model

Pressure and Release model developed by Blaikie *et al.* (1994) is used in order to examine the various forces which makes the Karrayu pastoralists vulnerable to climate variability. The model is chosen as it is particularly useful tool for a vulnerability analysis which it does by layering the analysis to look at the surface to underlying factors causing vulnerability, and thus helps to understand in depth the forces that aggravate vulnerability of the Karrayu pastoralists at local context.

The basis for the pressure and release (PAR) idea is that a disaster is the intersection of two opposing forces: those processes generating vulnerability on one side, and physical exposure to a hazard on the other (Blaikie *et al.* 1994). My focus is on the first side of the model, as I am looking at the forces that cause vulnerability of the pastoralist community, regardless of the usual risk of recurrent drought due to rainfall variability (which is on the other side of the model). According to the model, vulnerability is seen to progress with three main levels which include processes that are sometimes quite remote and lie in the economic and political sphere as shown in Figure 2 below. These are root causes, dynamic pressures, and unsafe conditions.

Root causes are the underlying causes, widespread processes within a society. They can be economic, demographic and political processes within society (Blaikie *et al*. 1994, Wisner *et al*. 2004), related to limited access to power and resources and political systems.

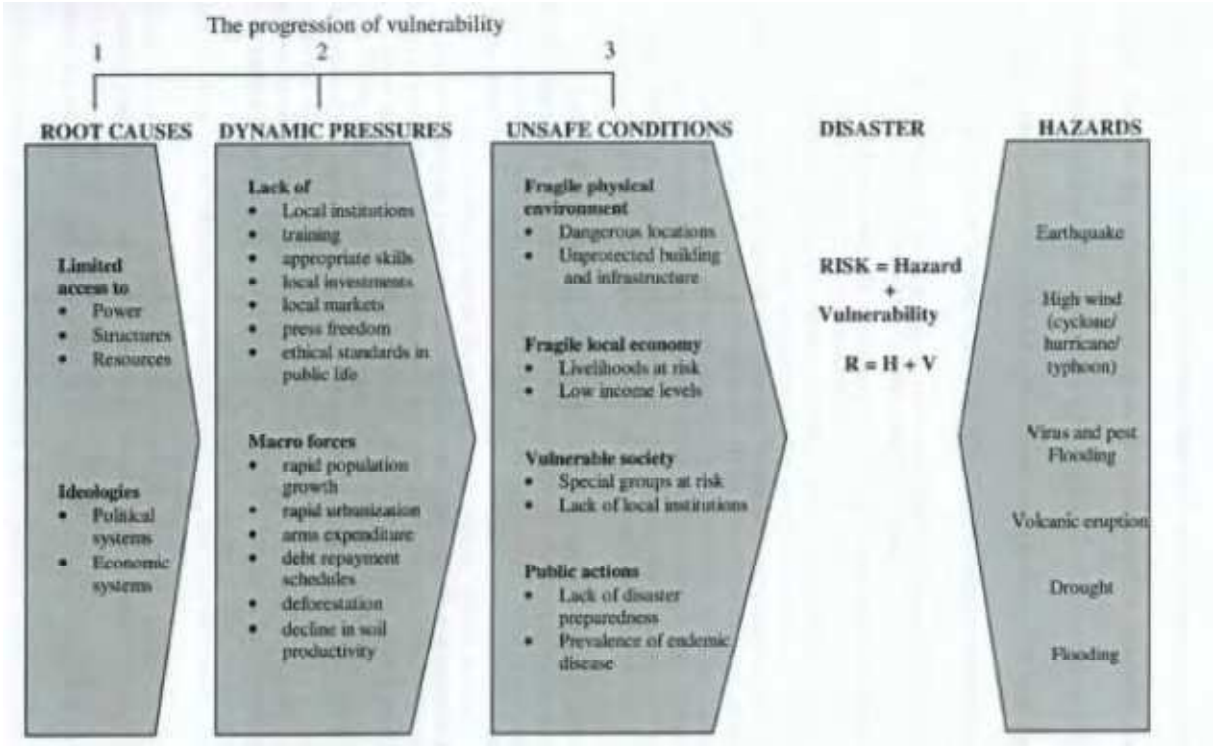

Figure 2. The Pressure and Release Model (Source: Blaikie *et al.* 1994)

Dynamic pressures, developed out of root causes in to specific types of insecurity, are processes and activities that 'translate' the effects of root causes both temporally and spatially into the vulnerability of unsafe conditions (Wisner *et al.* 2004). These are pressures related to lack and/or weakening of local institutions, lack of social services, lack of infrastructures like market, and population growth.

Unsafe conditions are the specific forms in which the vulnerability of a population is expressed in time and space; in other words they are the immediate manifestations of vulnerability (Blaikie *et al*. 1994, Wisner *et al.* 2004). These conditions are related to the physical environments like the location of settlements, and unprotected buildings and infrastructures, as well as to low income levels, lack of local institutions and public actions such as lack of disaster preparedness and prevalence of endemic disease. These conditions are the conditions under which people are conducting their daily lives. As unsafe conditions, most of the time related to buildings and settlements as discussed in Wisner *et al*. (2004), I prefer to use the term "at risk factor" in my analysis because in the pastoralist context it is natural settings and socio-economic conditions which create vulnerability.

3.2. Institutions, Adaptation and Livelihoods framework

The Institution, Adaptation and Livelihood framework developed by Agrawal (2010) is used to examine the relationships among climate-related vulnerabilities, adaptation practices, institutions, and external development interventions as shown in Figure 3 below. The framework indicates the critical role that institutions play in adaptation to climate variability and change. Institutions structure the impacts of climate risks on households in a given ecological and social context; shape the degree to which households' responses are likely to be oriented, individually or collectively; and also mediate the influence of any external interventions on adaptation practices (Agrawal 2010).

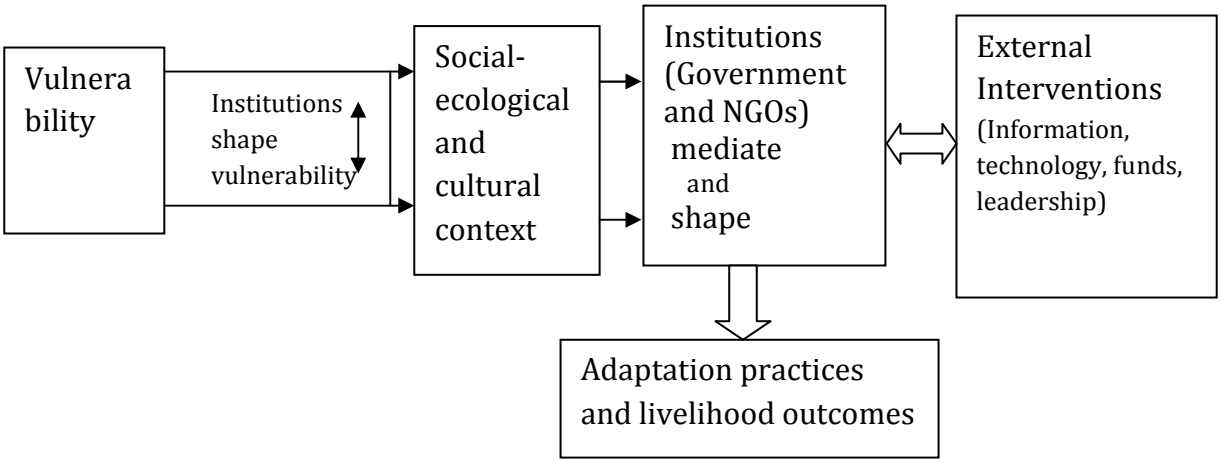

Figure 3. Institution, livelihood and adaptation framework (Source: Agrawal 2010).

Agrawal used the framework to analyze the role of local institutions in developing the adaptive capacity of the people, whereas I use the framework to analyze the roles government and non-governmental organization played and still playing in order to develop or destroy the adaptive capacity of the Karrayu pastoral community by adjusting to the local context of my study.

Institutions such as government organizations, non-governmental organizations, and local social organizations are fundamental in enabling adaptation and coping strategies by determining different people's access to various types of assets. The concept of institution varies. Institutions can be formal and informal, and they can have political and economic functions, such as establishing and protecting property rights, facilitating transactions, and permitting economic corporation and organization (Wiggins and Davis cited in Anderson *et al.* 2010). They added that institutions, such as government organizations, tend to structure assets differentially for men and women, for groups defined by their landholder or outsider status or by age and lineage, and for castes and occupational groups; and they can regulate

access to the various factors of production- land, labor, capital, and information (Anderson *et al.* 2010).

Institutions arise in many settings and play a wide variety of roles. According to Young *et al.* (2008) institutions that emerge in response to a demand for steering mechanisms to guide societies toward outcomes that are socially beneficial and away from outcomes that are harmful can become elements of governance systems. For the purpose of this study, I use the definition of institution in line with Agrawal and Perrin (2009) who defined institutions as structured, formal or informal organizations that are the means through which local households cooperate with each other or through which central governments and donors channel resources for local development.

Similar to vulnerability which is local by definition (Robit 1996), so as adaptation to climate variability and change is highly local (Nyong *et al.* 2007, Agrawal 2010, and Ruijs *et al.* 2011), and its effectiveness depends on local and extra-local institutions through which incentives for individual and collective action are structured (Agrawal 2010). Different development interventions that are taking place in response to the increasing climate variability and change in order to reduce vulnerability and increase the adaptive capacity of the community may worsen the condition if they do not consider the local context under which the vulnerable group and the poor lives. Efforts to address vulnerability of the poor and to improve adaptive capacity require deeper attention to institutions at multiple scales and careful planning to ensure that institutions can work to help poorer groups who are most at risk from increasing volatility in climate phenomena and its human impact (Agrawal 2010).

Adaptation to climate does not occur in isolation from the influence of other forces, but instead occurs amid a complex set of economic (micro and macro), social, and institutional circumstances which establish a location-specific context for human-environment interactions (Smithers and Smit 1997). Although households and communities historically have used many different strategies to adapt to climate variability and the vulnerability resulting from it, their capacity to adapt depends in significant measure on the ways organizations regulate and structure their interactions, both among themselves and with external actors. According to the framework, as Agrawal argues, all efforts to adapt depend for their success on specific institutional arrangements because adaptation never occurs in an institutional vacuum.

Government influence how households and communities are affected by climate impacts through its intervention; for instance, in case of my study area by leasing the grazing land for investors and taking the dry season grazing land for irrigation then limiting the

mobility of the pastoralists. The government also shape the ability of households and the community to respond to vulnerability to climate variability and change and to pursue different adaptation practices (for instance forcing pastoralists to settle at one place, so that their livelihood shift from pastoralism to agro-pastoralism), and mediate the flow of external interventions to facilitate adaptation.

The underlying socio-ecological and cultural context shape vulnerability of the community and has an influence on the adaptation practices people can take. On the other hand, the government institutions and their policies or strategies have an impact on the underlying socio-ecological and cultural context of the community. Most of the time the adaptation strategies that the government provides or implements for the local community represent top-down orders, without the consultation of the local community (vulnerable group), hence the outcome can be success or failure (maladpatation)- which may lead to more vulnerability. Similarly, nongovernmental organizations play a role in disseminating information for the community, resource mobilization and allocation, awareness creation, service provision, skills development and capacity building, and food relief provision. All interventions by government and nongovernmental organizations have an impact on the adaptive capacity of the community.

4. Methods

Researchers use different methods to conduct their research. Whether to use qualitative or quantitative or both depend on the objective of the study to be conducted. Silverman (2006) writes that "quantitative researchers are rightly concerned to establish correlations between variables. However, while their approach can tell us a lot about inputs and outputs to some phenomenon, it has to be satisfied with a purely 'operational' definition of the phenomenon and does not have the resources to describe how that phenomenon is locally constituted. As a result, its contribution to social problems is necessarily lopsided and limited". In contrast, the main strength of qualitative research is its ability to study phenomenon that are simply unavailable elsewhere, and to analyze what actually happens in naturally occurring settings (Silverman 2006, 2010; Kvale and Brinkman 2009; Hay 2010). The methods used by qualitative researchers exemplify a common belief that they can provide more in depth understanding of social phenomena than would be obtained from a purely quantitative methodology.

In fact, the choice between different research methods depends on what the researcher is trying to find out. In this study, I use qualitative case study research method to address my research questions which address about 'what', 'how', and 'why' the Karrayu pastoralists' vulnerability is changing and what new types of adaptive capacity are needed for survival, sustenance and well-being of the community. It is argued that qualitative case study is a powerful means by which to understand the concrete and practical aspects of a phenomenon or place, and it is valuable because, when done well, it produces deep, concrete explanations of social phenomenon that are attentive to a variety of contextual influences, at various scales (Hay 2010). I believe that this qualitative case study research helps me to understand my research questions intensively and historically by looking at the various forces interacting with one another, over the Karrayu pastoralists' community; and explaining the issue with specific to the Karrayu pastoralists will assure the credibility of my research.

The research question, for instance, 'what are the socio-economic conditions that create vulnerability to climate variability, and how does the community cope with or adapt to it and how is this changing?' helps me, on the one hand, to understand in depth the issues that cause the Karrayu pastoralists vulnerable to climate variability within the local context, and on the other hand, to understand and explain in detail the actions people used to and currently using in historical context and the processes involved in changing adaptation or coping practices of the community. Beyond these, I believe that this case study topic can be better

understood using qualitative method that captures human experiences and its subjectivity than by using quantitative method and comparing variables and looking for variance. In addition to these, practical considerations (like time, resource, the availability of data at that local context, and the level of my knowledge with the topic I am studying) are also some of the factors that necessitate me to choose qualitative research method.

4.1 Qualitative research method

Qualitative research is used in many areas of human geography. In a broad sense, qualitative research is concerned with elucidating human environments and human experiences within a variety of conceptual frameworks to reveal what has previously been considered unknowable like feelings, attitudes, perceptions and cognition, and hence to verify, analyze, interpret, and understand human environments and experiences of all types (Hay 2010).

Individuals experience the same events and places differently. Giving voice to individuals allows viewpoints to be heard that otherwise might be silenced or excluded (Hay 2010). A qualitative approach is sensitive to context and process, to lived experiences and to local groundedness, and the researcher tries to get closer to what is being studied. It aims for in-depth and holistic understandings, in order to do justice to the complexity of social life (Punch 2005). The experiences of individuals and the meanings of events and places cannot necessarily be generalized, but they do constitute part of a multifaceted reality. Qualitative geographical research tends to emphasize multiple meanings and interpretations rather than seeking to impose any one 'dominant' or 'correct' interpretation (Hay 2010).

Qualitative methodology recognizes that the subjectivity of the researcher is intimately involved in scientific research. Subjectivity guides everything from the choice of topic that one studies, to formulating hypotheses, to selecting methodologies, and interpreting data. In qualitative methodology, the researcher is encouraged to reflect on the values and objectives he/she brings to his/her research and how these affect the research project. Other researchers are also encouraged to reflect on the values that any particular investigator utilizes (Ranter 2002).

In qualitative research, the number of people we interview, communities we observe, or texts we read is an important consideration, but secondary to the quality of who or what we involve in our research and secondary also to how we conduct that research (Hay 2010). Similarly, Punch (2005) argues that, in qualitative research, prestructuring of design and data is less common, and its methods are less formalized than those in the quantitative approach. It therefore has greater flexibility, responding to the direction in which interviewees take the

interview and perhaps adjusting the emphases in the research as a result of significant issues that emerge in the course of interviews.

Qualitative research can be descriptive or explanatory. Punch (2005) argues that the description-explanation distinction is easy to understand at one level, and difficult to understand at another. To describe is to somehow draw a picture of what happened, or of how things are proceeding, or of what a situation or person or event is like. Whereas, to explain is to account for what happened, or for how things are proceeding, or for what something or someone is like. It involves finding the reason for things, events and situations, showing *why* and *how* they have come to be what they are. Punch (2005) writes that description is a more restricted purpose than explanation, in the sense that one can describe without explaining, but one cannot really explain without describing. This indicates that explanatory knowledge is more powerful than descriptive knowledge; but descriptive knowledge is still important, since explanation requires description. Thus, to know why something happens, it is important to have a good description of exactly what happens.

I use both descriptive and explanatory research, in order to describe the social factors that make the Karrayu pastoralists vulnerable to climate variability and change, and to explain how their vulnerability is changing and how they adapt and cope with the changing environment at the local context and also to explain how their system of adaptation practices are changing. To achieve these, different methods of qualitative data collection are used: interviews, focus group discussions, and observation. I used these different methods, for instance interview and focus group discussion, to answer the same question in different ways (methods) or from different angles, so that it helps me to find a different opinion or answer. Similarly, using these three different methods of qualitative research helps me to corroborate one source and method with another, and enhance the data quality, in the form of triangulation.

4.2 Data collection

Data collection was carried out in Ethiopia for two months, from June 15 to August 15 2012. In the first place, in Ethiopia, it is very important to get permission to collect data of any kind and to interact and talk to the people. There are different levels of administration in the country: The Federal government, the Regional government, the Zone administration, Woreda (or District) administration and Kebele administration. I started my work at Zone level. It took me some days to convince the Zone administration to give me permission to carry out research. To become more clear and reduce their suspicion over me and over the nature of

data to be collected after getting permission from Zone Administration Head, I started my interview at Zone Administration offices with Zone's Food Security Programme officer, and Zone's Environmental and Disaster Protection and Preparedness officer. It is after these two key informant interviews that I got the letter of support to the district of my study area, where my fieldwork is central.

To get in contact with and identify informants is the basic task of data collection during field work. On the one hand, it is not difficult to get in contact with government officials, as one can go and find them in their office. Interviews were conducted on the same contact day with some officials, and through later appointments with others. On the other hand, to get in contact with informants from the community was not an easy task. It was with the help of one informal young informant in the small town of the district who took me to all informants in the village as a guide. I also appreciated the nomination made for me by the government official informants in the district, who positively mentioned for me some of the community elders who are capable of explaining the issue I am exploring, and also well aware of the history and social structure of the society. Except for one informant, with whom the interview was conducted on the day of contact at his home, interviews with the rest of the informants were conducted by appointment and it was in quiet open space under the tree in rural areas.

The data collection involved both primary and secondary data. Secondary data was collected from different institutions (both governmental and non-governmental organizations (NGOs)) to supplement the primary data. These secondary data include published and unpublished documents of theoretical and empirical nature, and various activity reports of governmental and non-governmental institution. Further, related federal and regional government policies, strategy documents, newspapers and proclamations will be reviewed and used.

Primary data was obtained through interviews and focus group discussion with experienced people and local community elders, and government and non-governmental organization officials during the fieldwork. However, key informant interviews are the main data source used in this study. I conducted focus group discussions after I finished interviews, with the intention to find different information from my key informant interviews and to support as well as check the information I obtained from my key informants. For both key informant interviews and focus group discussions, I prepared an interview guide to use while conducting interviews and to raise topics of discussion for focus group discussions participants. Besides these two techniques of primary data collection, I used observation

throughout the rural parts of my study area to check some of the information obtained from the government officials. This included verifying what they have done on the ground and observing practical problems in the community. In the following section, I elaborate on the techniques of primary data collection used during my field work.

There are different techniques/methods of qualitative data collection during fieldwork. Interviewing is one of the methods, and it is defined by Cloke *et al.* (2004) as "conversation with purpose", and although the conversations varies across a range of structured, semi-structured, and structured formats, their purpose is to give an authentic insight into people's experiences.

Before I went for fieldwork, I prepared an interview guide with a list of questions or fairly specific topics to be covered, but my informants have a great deal of freedom in how to reply. Questions for the interview guide were prepared from different literatures and secondary materials. I asked questions that were not included in my interview guide as my informants said new things, especially those I considered important to my study. I also used follow up questions, like asking my informants for elaboration of their answer, and following up what has been said through direct questioning, like for more explanation or why and/or how something happened. At the end of each interview, I asked my informants if they had something to add or if I did not ask them something very important they should be asked, so that my informants were allowed freely to include important issues that are not covered during the interviewing; and of course, of which I benefited a lot.

4.2.1 Key informant interview

Key informant interview is the major data generation technique employed in the course of my research. I use key informant interviews under semi-structured interview method to collect the data, because "it allows flexibility for the researcher" (Byrman 2004) during the interview process, and its flexibility provides the researcher to explore new ideas and issues that had not been anticipated in planning the study but that are relevant to its purpose (Kumar 1989). It is important to be responsive to what informants say and following up interesting points that they make. Such flexibility is important, and it also helped me in following up and cleaning up inconsistencies in answers.

Key informants are individuals with whom the researcher begins in data collection because they are well informed, are accessible, and can provide leads about other information (Gilchrist cited in Creswell 2007). In a similar way Kumar (1989) writes that "key informant interviews involve interviewing a selected group of individuals who are likely to provide

needed information, ideas, and insights on a particular subject", with two characteristics: only a small number of informants are interviewed and key informant interviews are essentially qualitative interviews.

Key informant interviews are appropriate for generating information and ideas in situations when general descriptive information is needed, and when understanding of the underlying motivations and attitudes of a target population is required. It is argued that key informant interviews can help determine not only what people do but why they do it. Such interviews are excellent for documenting people's reasons for their behavior and people's understandings or misunderstanding of issues (Kumar 1989). Hence, thirteen (13) key informants were interviewed: five government officials (two at Zone level and three at district level); five key informants of the five clans/gosa leader of the community; and two elders outside the community leaders and one NGO official, as indicated on Table 1 below. Figure 4 below also indicates the kebeles within the Fantalle district, and the neighbors of the Karrayu pastoralists and the road infrastructure in the district. In addition different informal talks and discussion with different people are used to supplement my main data generation techniques.

Table 1. Indicates the number of Key informants and focus group discussion participants conducted at different places.

Informants / participants	Places	Remark
2 informants	Zone capital (Adama town)	Government officials
3 informants	District capital (Matahara town)	Government officials
5 informants (clan leaders)	Galcha, Banti, Haro-Adi, Dire-Saden & Tututti	Community
2 elders	Matahara town	Community
1 local NGO manager	Matahara town	NGO
1 focus group (7 men)	Qararri	Community
1 focus group (7 women)	Dire Saden	Community

Source: Fieldwork

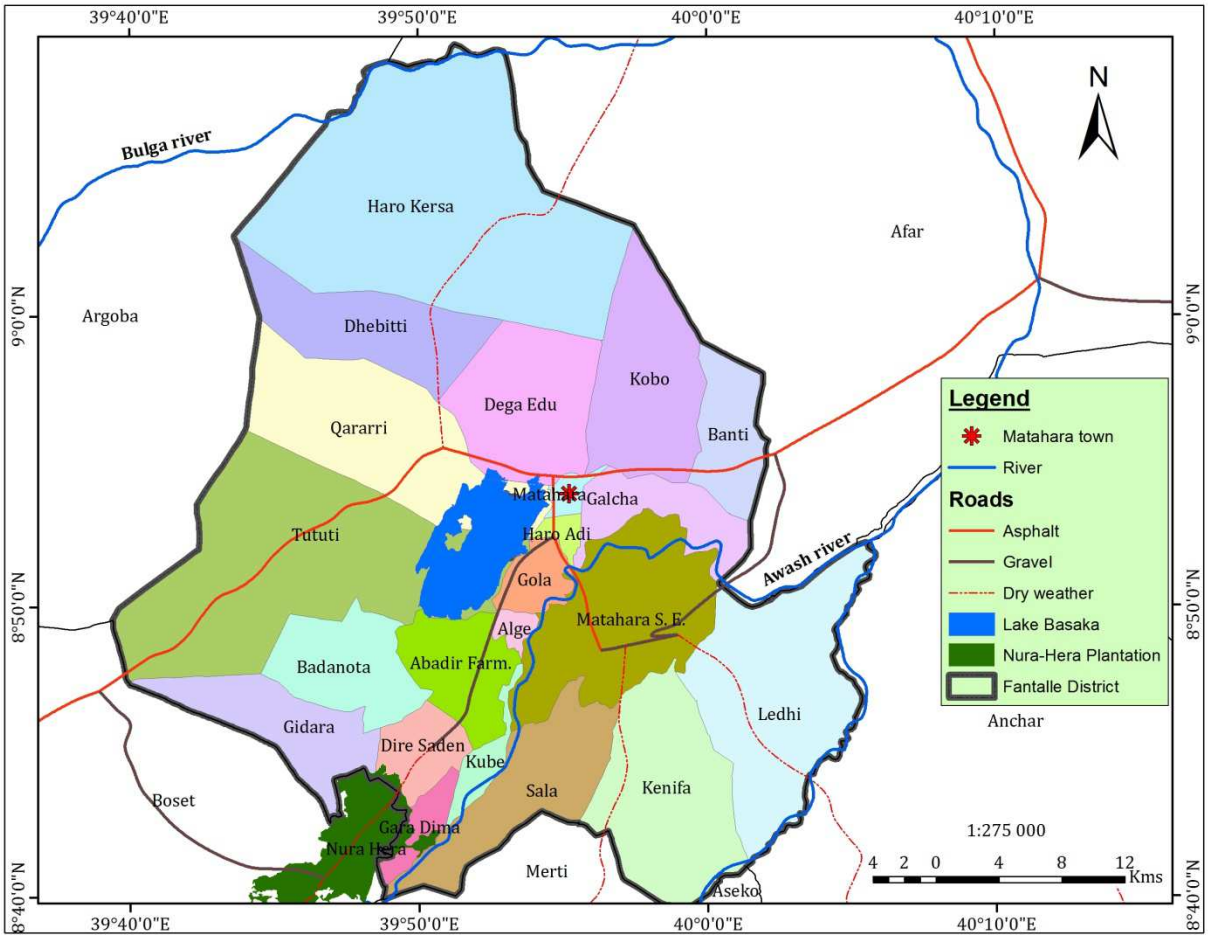

Figure 4. Map indicating the Kebeles, the neighborhoods and available road infrastructure of the Karrayu pastoralist community (Data source: CSA 2009, and mapped by the Author).

Key informants were selected purposefully, considering the structure of the society as well as the government and the content of the inquiry. For instance, key informant interviews with government officials were held with officials who have direct concern with the pastoralist area or who are leading the projects in the pastoralist area understudy or working as professional expert in the pastoralist areas. Hence, the Food Security Programme officer, and Environmental and Disaster Protection and Preparedness officer at zone level; and the Productive Safety Net Programme (PSNP) manager, the Pastoralist Commission Development Programme (PCDP) officer, and District's Security Issues officer at district level were interviewed.

Key informants from the community were selected basically based on their role within the community (as elders, or clan leaders) and their knowledge, willingness and impartiality. Key informant interviews were held with community elders who have lived in the study community for a considerable length of time and know the culture and social structural organization of the community and therefore are in a position to provide a wide spectrum of

general and personal views. They include community leaders from the five gosa/clan leaders of the community (which include *Abba Gadaa*), and other elders who have lived there and have potential and knowledge on the subject matter under investigation. Because information comes directly from knowledgeable people, key informant interviews often provide data and insight that cannot be obtained with other methods. All interview data were tape recorded, and note taking was also used. However, one government official at Zone level refused tape recording and only note taking is used with him.

4.2.2 Focus group discussion

As discussed above, focus group discussion is used to complement the information obtained from the key informant interviews. Again focus group participants were selected based on their role in the community, their acceptance with community and their knowledge of the culture and social organization of the community. Information about the participants was acquired from different angles. For instance, while I was conducting key informant interviews I asked my informants to tell me any other individual whom they think capable of explaining the issue I have asked them. This technique may be similar to what Hay (2010) calls snowball sampling, which is a sampling technique used to identify cases of interests reported by people who know other people involved in similar cases. In addition I also used local administrators to nominate capable individuals for me so that I can go and talk to them. In focus group discussion, individuals who were my key informants were not included. This helped me to avoid the redundancy of information from the same individuals and to find new information from new participants. Focus group discussions were conducted with groups of seven people in two different groups, one group containing seven women and the other group seven men, at different places. This grouping was done to avoid some traditional perceptions in the community that women could not speak equal to men at public, hence in this way of grouping women could speak with full confidence that could help me acquire full information from their perspective.

It is argued that focus group discussion allows the researcher to develop an understanding about why people feel the way they do (Byrman 2004). The focus group approach offers the opportunity of allowing people to probe each other's reason for holding a certain view. It is very interesting to watch and listen while the participants argue for or against each other, and probe each other. It is interesting for one thing that participants, after answering in a certain way during a focus group discussion, want to qualify or modify their view after they listens to others' answers; and for the other thing that a participant want to

voice agreement to something that he or she probably would not have thought of without the opportunity of hearing the views of others. These possibilities mean that the focus groups may also be very helpful, as Bryman (2004) writes, "in elicitation of a wide variety of different views in relation to a particular issue". Another important thing in the context of focus group discussion is that, individuals often argue with each other and challenge each other's views. This process of arguing provided me chances of acquiring more realistic accounts of what people think, because they are forced to think about and possibly revise their views. Participants were also encouraged to bring to the fore issues in relation to a topic that they think to be important and significant. This is clearly an important consideration, since the viewpoints of the people being studied are an important point of departure. To keep track of discussion smooth and uninterrupted by following who says what, tape recording was only used to capture the data acquired from the group discussion. Note taking is difficult during focus group discussion, because it may lead to interruption as well as it is difficult to follow the eye of the people whether they agree with the idea one speaks or not, the body languages, and facial expressions people show, which may be lost during note taking. Focus group discussion was ended by giving the opportunity for the participants to speak anything they want to ask or raise issues for further discussion.

4.2.3 Observation

Observation is a fundamental and highly important method in all qualitative inquiry (Marshall and Rossman 2011). It is used to discover complex interactions in natural social settings. They argue that even in studies using in-depth interviews, observation plays an important role, as the researcher notes the interview partner's body language and affect, tone of voice, and other paralinguistic messages, in addition to the words. Hence, knowledge or evidence of social world can also be generated by observing, or participating in, or experiencing natural or real-life settings, and interacting with situations. These kinds of settings, situations and interactions 'reveal' data in multidimensional ways, and also that it is possible for a researcher to be an interpreter or knower of such data as well as an experiencer, observer, or participant observer. Choosing to use observational methods usually coincides with the view that social explanations and arguments require depth, complexity, roundedness and multidimensionality in data, rather than surface analysis of broad patterns, or direct comparisons of "like with like" (Mason 2002).

My observation throughout my study area (as indicated in Figure 4 above with all opportunities to the accessible areas) helped me to clearly understand the natural

environmental setting, the social-economic activities of the area, the "development" activities or projects (like irrigation project - to understand how it is organized or operates), the Matahara sugarcane factory (through which I crossed to travel from one village to another village to conduct my interview), resettlement areas and Nura-Hera plantation farm and its expansion. It is fortunate, that I observed the overflowing of Lake Basaka over two Kebeles (*Galchaa* and *Bantii*). I also got the opportunity for one day with District administrators to participate and observe while they were distributing land for the pastoralists.

Similarly, the NGO I conducted an interview with also facilitated conditions for me to visit their projects for pastoralists (such as nursery site, schools, health centers and shoat fattening) in very far villages from their office. I also observed a sense of fear from people with whom I talked formally or informally, especially due to the conflict with the neighboring Argoba and Afar. One month before I conducted my research, people told me that there was a conflict with their neighboring Afar pastoralists. And, starting three weeks before and continuing while I was conducted my research, there was a conflict with Argoba agro-pastoralists, which cost the lives of three Karrayu young pastoralists and injured two. I talked to one of the injured pastoralists who was taken care of (with all its medical expenses) by the NGO with which I conducted the interview, and he explained to me that such conflicts were irregular in the past, but now they were happening day after day. Some of the observations I conducted were by plan (such as irrigation project, resettlement areas, Lake Basaka, and Nura-Hera plantation farm), while others were conducted while I was moving throughout the district to talk to people for my interview, and with any opportunity I got to move to the villages. Hence, all things that I observed added for me a great knowledge about the condition and situation of my study area, which I could not understand without seeing and observing it. Therefore, it is important to observe in order to understand how setting functions and interactions in physical organization which is discernible, perhaps, practices, perceptions and assumptions of people within it. That is, maybe, why Mason (2002) writes that knowledge generated through high quality observation is usually rich, rounded, local and specific.

The purpose of my observation was to understand the general condition of my study area and to witness or experience what was going on in a setting or on the ground. Observation also helped me to answer some of my research questions, or to approach them from a particular angle, especially after conducting interviews which helped me either to confirm or disprove the information or data I collected from my informants and hence I used observation as part of a multi-method strategy to assure data quality.

4.3 Reliability and Validity

Both qualitative and quantitative researchers need to test and demonstrate that their studies are credible (Golafshani 2003). Golafshani argues that while the credibility in quantitative research depends on instrument construction, the credibility of a qualitative research depends on the ability and effort of the researcher. The credibility of qualitative research studies rests not just on the reliability of their data and methods but also on the validity of their findings (Silverman 2006). Although reliability and validity are treated separately in quantitative studies, these terms are not viewed separately in qualitative research. Instead, terminology that encompasses both, such as credibility, transferability, and trustworthiness is used (Golafshani 2003, Hay 2010).

Silverman (2006) suggests that both reliability and validity are important issues in field research, and reliability can be addressed by using standardized methods to write field notes and prepare transcripts. To assure reliability, Tremblay (1957) argues that, cross-comparison is feasible and should be utilized as much as possible during data collection; this will give some indication of reliability and reveal areas of discrepancy where more intensive interviewing may be needed.

Reliability and validity are conceptualized as trustworthiness, rigor and quality in qualitative research methods. It is also through this association that the way to achieve validity and reliability of a research get affected from the qualitative researchers' perspectives which are to eliminate bias and increase the researcher's truthfulness of a proposition about some social phenomenon using triangulation (Golafshani 2003). Different authors have defined triangulation with very slight differences. It is defined as "a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study" (Creswell & Miller cited in Golafshani 2003). Similarly, Patton (2001) and Jick cited in Hussein (2009) defined triangulation as "the use of multiple methods mainly qualitative and quantitative methods in studying the same phenomenon" for the purpose of increasing study credibility.

It is indicated that there are five types of triangulation: data source triangulation, methodological triangulation, theoretical triangulation, investigator triangulation, and analysis triangulation. If a researcher employs more than one type of triangulation in a single study, then according to Polit and Hungler (1995) cited in Hussein (2009), it is said to have employed a multiple triangulation. For the purpose of my study, I used data triangulation, methodological triangulation and theoretical triangulation. Data triangulation also referred as data sources triangulation depicts the use of multiple data sources in the same study for

validation purposes (Hussein 2009). Methodological triangulation is defined as the use of more than two methods in studying the same phenomenon under investigation (Hay 2010); whereas theoretical triangulation is defined as the use of multiple theories in the same study for the purpose of supporting or refuting findings since different theories help researchers to see problem at hand using multiple lenses (Hussein 2009). Hence, the theories I used provided me broader and deeper understanding of my research problem in supporting each other.

I used data source triangulation and methodological triangulation to increase the credibility of my research findings. As mentioned above under the section on data collection, I used different data sources which include both primary and secondary data. In addition to this, I used different methods (techniques) of data collection to make my research valid and reliable by using methodological triangulation. Hussein made distinction between two types of methodological triangulation that is the between- and within-method type of methodological triangulation. Hussein further explained that the 'between-method triangulation' or across-method triangulation involves combining and utilizing both qualitative and quantitative methods in studying a single phenomenon; and it has been used for the aim of achieving convergent validity and testing the degree of external validity. Whereas the 'within-method triangulation' involves crosschecking for the internal consistency (Hussein 2009). Hence, my methodological triangulation directly refers to the within-method triangulation, because I used interviewing, focus group discussion and observation under qualitative research method to cross-check the validity of the data I was collecting and to insure its consistency. Within-method type of triangulation implies that multiple complementary techniques within a single method are used in data collection and analysis. In doing so, I believe, I can increase the internal credibility of the research findings.

Therefore, to acquire valid and reliable multiple and diverse realities, multiple methods of searching or gathering data are important. Then the use of method and data triangulations to record the construction of reality is appropriate. Engaging multiple methods, such as interviews, focus group discussions and observation will lead to more valid, reliable and diverse construction of realities. Hence, triangulation helped me understand in-depth and widen my knowledge of the issue I am dealing with as well as used as measure of validity and reliability by increasing the accuracy of my study.

4.4 Ethical considerations

All social research involves ethical issues. This is because the research involves collecting data from people, and about people (Punch 2005, Hay 2010). Decisions about which research

topics to pursue, appropriate and worthwhile methods of investigation, right way to relate to sponsors of and participants in research, and appropriate modes of writing and communication of results involve ethical questions (Kvale and Brinkmann 2009, Hay 2010). These questions include how researchers ought to behave, the role of research in the pursuit of social change, and whether and how research methods are 'just' (Hay 2010).

It is argued that ethical issues can arise in both qualitative and quantitative approaches, but they are more likely and more acute in some qualitative approaches. This is because, as Punch (2005) writes, while all social research intrudes to some extent in to people's lives, qualitative research often intrudes more. Some qualitative research deals with the most sensitive, intimate and innermost matters in people's lives, and ethical issues inevitably accompany the collection of such information (Punch 2005). However, not all qualitative studies present such extreme ethical dilemmas (Marshall and Rossman 2011). Nevertheless, it is necessary that researchers must anticipate more routine ethical issues and be prepared to make on-the-post decisions that follow general ethical principles. In addition, Marshall and Rossman write that the researcher must demonstrate awareness of the complex ethical issues in qualitative research and show that the research is both feasible and ethical.

Authors such as Marshall and Rossman (2011), Punch (2005), (Hay 2010), Kvale and Brinkmann (2009) argue that informed consent, privacy and confidentiality, and harm to participants are the most important issues of ethical guidelines for researchers. These ethical issues go through the entire process of the research, and potential ethical concerns should be taken in to consideration from the very start of an investigation to the final report. In what follows, I address these important issues in relation to my research.

3.4.1 Informed consent

Informed consent is an informant/subject agreement to participate in a study having been fully apprised of the conditions associated with that study (for example, time involved, methods of investigation, likely inconveniences, and possible consequences) (Hay 2010). It is a key principle in social research ethics (Bryman 2004). Bryman further argues that informed consent implies that prospective research participants should be given as much information as might be needed to make an informed decision about whether or not they wish to participate in a study. This means the researcher has to get permission from the research participants. However, as Hay (2010) put it, this permission is somewhat stricter than a simple "yes, you can interview me". It must be informed consent and informants need to know exactly what it is that they are consenting to.

To begin the field work and collect data in my study area, it was necessary to get permission from the government officials. Hence, I started seeking permission at Zone level administration. After briefly explaining the purpose of my research (that it is part of my masters study program and it is for the completion of my masters degree) and objectives (how the Karrayu pastoralists became vulnerable to climate variability and how they are adapting to it, and what are the roles of institutions to develop the adaptive capacity of the community), and possible questions that I can ask both the government officials and people from local community, permission was granted. Hence, I submitted my interview guidelines and also orally explained the overall purpose of the research and the main features of the research design and procedures that I use to collect data and information from the officials and from the community and what I expect from the officials as well as from the community. I explained for the administrator the government sectors I need to talk to, those who have a direct link with the issue I am looking for and relevant to / active in my study area. The Zone administrator facilitated for me the sectors at Zone level and gave me a letter of permission and assistance for the District level administrators. It was after getting this permission from the Zone administration that I started seeking the informed consent of my informants.

All of my informants and focus group discussion participants were informed about the overall purpose of the research, and that their participation was voluntary and they had a right to withdraw at any time. They were also informed that it was not obligatory to answer (or give information) to a question (guiding or probing question) that they did not want to answer. My research informants and participants were also informed about confidentiality and who will have access to the interview or other material, and my right to publish parts of the transcribed interviews.

4.4.2 Privacy and confidentiality

Qualitative methods often involve invading someone's privacy (Hay 2010), as it involve asking very personal questions or observing interactions in people's homes that are customarily considered private. Most of my key informant interviews with the community, except one, were held outside of the home of the informants. As the interview was conducted in the rural area, I told my informants that I would like to conduct the interview outside their home by sitting under the big tree as our (Oromo) tradition. They were very happy about this; and this helped me not to invade their privacy at their home and developed the trust and respect that I have for them and their traditional culture. Further, this contributed for my informants to trust me on the issue of their privacy and confidentiality. My being from the

same people (Oromo people) as my informants and participants that speak the same language helped me to act accordingly so that I cannot violate some strict rules of greeting the elders or old people and the way to talk with them (in general norms and values of the community) and I cannot use them "as a means to an end" (Marshall and Rossman 2011) due to the feeling of "ours". This helped me to collect valuable information for my study. Similarly, my focus group discussion was conducted in the same way as of my key informant interviews.

To protect the privacy of my informants, all materials that I used, like tape recording, field notes and transcribed documents were kept confidential, in such that they will not be released to the public at any time. My informants as well as focus group participants have been given anonymous names, so that they cannot be identified by others. However, some of the informants were not happy being anonymized, as it produce suspicion, and one of my focus group participant raised the question "why anonymization is necessary once you explained what you need from us and we agreed up on it?" For instance, during the focus group discussion all of my informants were called by their anonymous names, so that when I give the chance from one participant to the other, I will not call their names. This is done due to the fact that I have used only tape recording for my focus group discussion. By doing this none of my participants can be easily identified. Similarly, other characteristics like masking with their profession have been used for my key informants.

As Kvale and Brinkmann (2009) argue the principle of the research participants' right to privacy is not without ethical and scientific dilemmas; however I made possible efforts for privacy of my informants and the confidentiality of the information they provided me. Confidentiality as an ethical field of uncertainty relates to the issue that, on the one hand, anonymity can protect the participants and is thus an ethical demand, but, on the other hand, it can serve as an alibi for the researchers, potentially enabling them to interpret the participants' statements without being gainsaid (Kvale and Brinkmann 2009). These authors further write that, anonymity can protect the participants, but it can also deny them "the very voice in the research that might originally might have been claimed as its aim". As I mentioned above, most of my informants wanted their names to be mentioned and insisted that I have to acknowledge them with their correct names for the valuable information they gave me and their time. This is happened after I thanked them for all the time and information they gave me. However, private data that can reveal the name or personal identity of participants is not be included in my study.

The issue of confidentiality also raises other particular difficulties. Although it is possible to anonymize the informants and participants of the research through different ways,

it is practically very difficult to anonymize places. The use of pseudonyms is a common recourse, but may not eliminate entirely the possibility of identification. Hence, with a view that not all qualitative research is equally harmful and has to be equally confidential, the place of my study is not anonymized in this study.

4.4.3 Harm to the participants

The consequences of a qualitative study need to be addressed with respect to possible harm to the participants as well as to the benefits expected from their participation in the study (Kvale and Brinkmann 2009). It is clear that the research should not expose the researcher and the participants of the research to any physical or social harm, as Marshall and Rossman (2011) writes "first, do no harm". It is the responsibility of the researcher to do whatever he/she reasonably can to ensure that participants are not harmed by participating in the study. This can be done by being aware in designing the research and knowing the possible harms and minimizing it to the least possible.

After briefly explaining my research to my informants, I asked all my informants and participants "if they see any kind of harm in participating in my research" and almost all of them were positive in participating. Since most of my questions were about "what makes them vulnerable to climate variability and how that vulnerability is changing over time, and how their adaptation system is changing with the changing vulnerability?", all of my informants freely provided me helpful information relating to their history, other environmental changes they have been observing in their area, and different activities taking place on their land; and how all these affected them. Even though my informants and participants say they did not see any harm in providing me their valuable information, I have not disclosed any of my informants and participants to be identified in public. The identities and information obtained from my informants and participants are kept confidential, as mentioned above under confidentiality and privacy.

5. Analysis I: Vulnerability and Adaptation

The analysis of adaptation is intimately associated with vulnerability. Adaptations are manifestations of adaptive capacity, and they represent ways of reducing vulnerability to climate variability. As discussed in the literature review chapter above, climate variability is posing a great challenge to pastoralists in Ethiopia. This part of analysis addresses my first research question (*What are the socio-economic conditions that create vulnerability to climate variability, and how does the community cope with or adapt to it and how is this changing?*), which is important to understand the role of climate variability on pastoralists and how they are responding to it during the past and at present. Vulnerability is local, so as adaptation to it is very local. Hence, this part of analysis explains how the Karrayu pastoralists' community have become vulnerable to climate variability in its local context and how they are responding to it.

5.1 Vulnerability

Vulnerability in the context of climate variability and change varies from place to place, and from livelihood to livelihood and over time. Although recurrent drought due to rainfall variability is a perennial risk to Karrayu pastoralists, which they have been used to for thousands of years, the current and emerging concern for pastoralists is other factors that increase their vulnerability to climate variability and change. The pressure and release (PAR) model is used to analyze these different factors, which include socio-economic, political and environmental factors.

The government policy towards pastoralists and the attitudes the government officials have for the pastoralists are the root causes for the progression of vulnerability. The government policy dispossessed their ownership of land, and the government officials view pastoralism and pastoralists as "backward culture" which does not contribute actively to the economy of the country. The government's rural policy made its centre the farming community (which of the majority are in the highland) and the implementation of the policy is for the whole rural people. This lack of consideration of the pastoralists in designing the policy made them marginalized. The marginalization made the relationship between the pastoralists and the government as "hostile". The government policy limits their access to their key resources (pasture and water) by expropriating their dry season grazing land through different large scale irrigation projects and restricted their mobility. Hence, as indicated in Figure 5 below, negative perception toward pastoralists, inappropriate policies for the pastoralists, development interventions, limited access to key resources, political

marginalization, and restricted mobility are the root causes of their vulnerability; where government policy over pastoralists and development interventions in the area are discussed below in detail.

The dynamic pressures, in case of Karrayu pastoralists, which transfer the root causes in to at risk factors are many, as indicated in Figure 5 below. They are socio-economic pressures as well as environmental pressures. The food insecurity due to lose of milk and milk products and lose of fruits from riverine forests has increased the vulnerability of the Karrayu pastoralists to climate variability. In addition, the expansion of "opportunistic" farming and the expropriation of large amount of the grazing land for Wildlife Park has removed valuable land from grazing, and resulted in high population pressure over the available grazing land. I explain below in detail how Awash National Park and population pressure are affecting and increasing the vulnerability of Karrayu pastoralists to climate variability. Besides, the traditional institution that encourage the community to help each other at times of drought (and any time the community face challenges either due to manmade or natural) is weakened (this will be discussed in next section under adaptation). Similarly, different environmental pressures play a role in aggravating the vulnerability of the Karrayu pastoralists. Among other things, invasive bush encroachment and expansion of Lake Basaka are discussed later as dynamic pressures.

At risk factors are the conditions under which people conduct their day to day lives. There is an overlap between dynamic pressures and at risk conditions. However, I mention some important points of at risk factors in relation to the Karrayu pastoralists. The Karrayu pastoralists are living under the condition where there is inadequate drought preparations and responses. The early warning system of the district is poorly organized both with human and material resources. Even, the available information does not reach the community, as the officers believe it is unreliable. Their livelihood strategies is based on livestock; and the lack of alternative livelihood strategy due to the underlying environmental factors as well as lack of skills put the community under risk of climate condition. Generated by the root causes and dynamic pressures above, the mobility of the Karrayu pastoralists is reduced and they do not have pasture reserves, as they used in the past times. The search for pasture at borders to their neighbouring pastoralists community and agro-pastoralists community has created a violent conflict. I discuss below in detail conflict as at risk factor, generating the vulnerability of the Karrayu pastoralists to climate variability and change. In addition, the weakening of their traditional institution created a fear in the community, as the elders say that "different

intervention by government and nongovernmental organizations unreservedly work to undermine our culture, which leads to some of our people violate our traditional rules."

Hence, in the following discussion, I focus on important points that generate vulnerability in the context of my study area. First, I discuss root causes-(government policy and development interventions), then, as dynamic pressures-(Wildlife Park, population pressure, Lake Basaka, and bush encroachment) and finally, as at risk factor-(conflict), as indicated in bold in Figure 5 below.

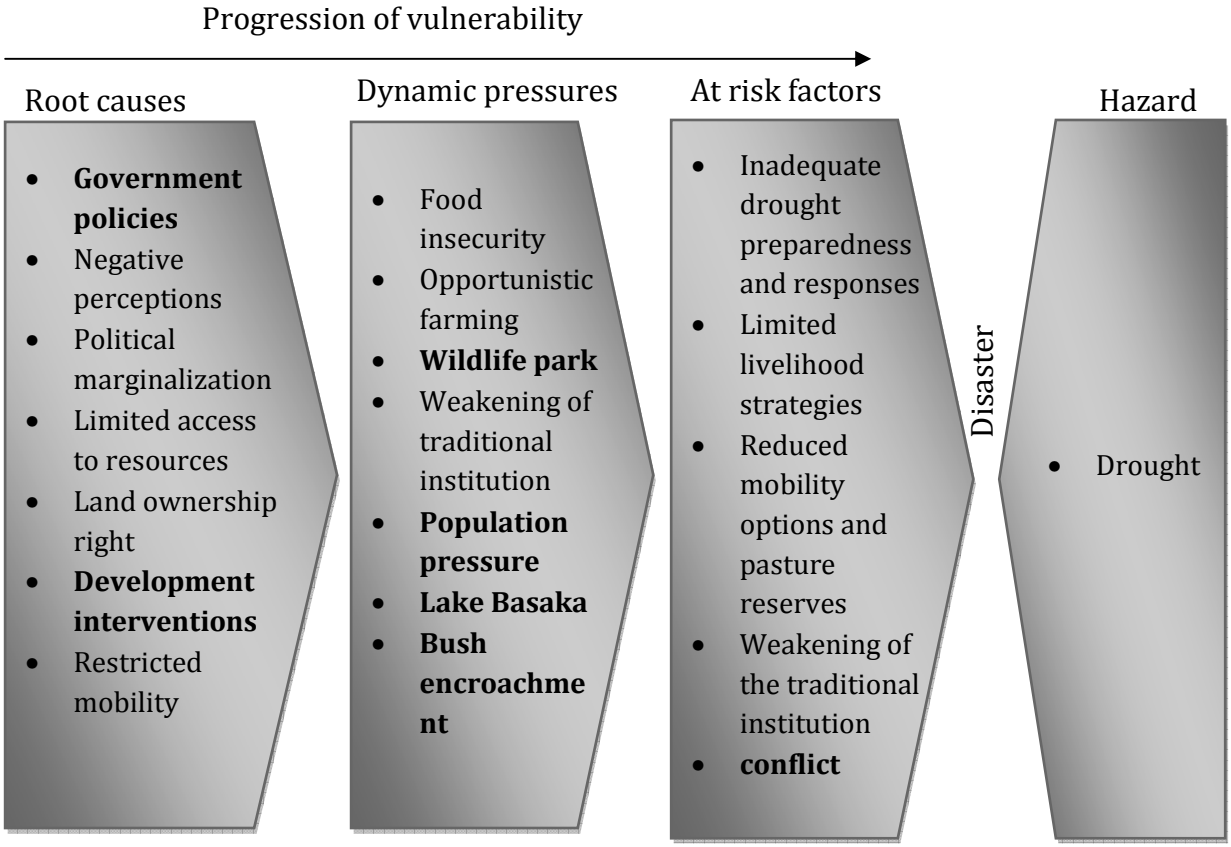

Figure 5. Factors which create vulnerability amongst the Karrayu pastoralist community.

A. Government policy

Government, through its policy favours farmers and permanent settlement by giving cultivators (farmers) more security on land ownership through right of inheritance, then by marginalizing pastoralists to the extent that they have the right to free land for grazing. Hence, those people on the margins of the pastoralist area are always favoured to exploit the uncultivated land of the pastoralists. These issues, as discussed below, restrict their mobility and diminish their grazing land.

In Ethiopian history, governance is dominated by manipulation of ethnicity, patronage and political culture of exclusion (Hogg 1997). This history is still continued at large.

However, although the current government of Ethiopia has made some sort efforts to include pastoralists in the civil service, cabinet ministries, and the army, they are still not adequately represented in the political life. The Karrayu pastoralists explain this issue of political marginalization due to their lack of (or very little) of formal education. The past regimes have done nothing for the people except expropriating their resources and land. Although the current government is trying to provide basic services for the pastoralists, its pre-requisite is a bottle neck for the implementation of the desired basic services like education, health, and other services. The government wanted the pastoralists to settle at one place so that the government can provide education, health services, potable water and other social infrastructures.

As with all pastoralists in Ethiopia, land ownership is communal for Karrayu pastoralists. Communal land ownership relates to a system of tenure in which the clan or a group of community has access to land. Currently, in Karrayu pastoralists, this communal ownership of land is under big challenge. The current rural land use planning programme of the government for the whole country, which is basically centred on the farmers on the highland part of the country, affects the Karrayu pastoralists at most due to their neighbourhood. In addition to this, the irrigation programme in the area is basically intended to resettle the pastoralists in the area and privatize the communal land by subdividing to pastoralists. This system of enforced change in the land ownership of the Karrayu pastoralists have been witnessed in the district bordering with the agro-pastoralists of Arsi Oromo and inside the centre of the district, named Dire Saden. This has created uncertainty and tension within the community. The communal ownership of the Karrayu recognize the communal use of land for grazing, and any attempt to own land by private and individualizing of grazing land was not advocated, and considered as violation of the rule of the Karrayu. However, due to weakening of the traditional institutions and rules of the Karrayu, and the unreserved support and courage given by the government for those who practice farming to discourage pastoralists, those individuals who violet the traditional rule are protected by the government and will not be punished as the community used to do in the past. This has impacted the traditional grazing patterns by reducing and fragmenting grazing areas, and hence disrupting coping strategies and making them more vulnerable to climate variability and change.

In addition, the irrigation potential of the Awash river attracted attention from the Ethiopian state as well as from commercial interests from the 1950s. As Muller-Mahn *et al*. (2010) indicated, the 1955 Constitution of Ethiopia formalized the situation that had in fact evolved since the incorporation of the lowlands into the Ethiopian state, by clearly stating that

"*all property not held and possessed in the name of any person, natural or judicial, including …. all grazing lands… are State Domain.*" Similarly, regarding land ownership of pastoralists in Ethiopia, Markakis (2004) writes that "the Land Reform in Ethiopia in 1975, which nationalized all land, mentioned the nomadic areas only to exempt them from the 10 hectares maximum limit per household imposed on cultivators. The government that came to power in 1991 modified the system to give cultivators more security through the right of inheritance, and to provide land for industry and agri-business on the basis of leasehold." On the one hand, Article 40 of the revised constitution in 1995 protects the right of pastoralists by saying "pastoralists have the right to free land for grazing and cultivation as well as the right not to be displaced from their own land". On the other hand, Article 130 (3) of the same constitution clearly put as "grazing lands are not held or possessed individually and hence belong to the government". This indicates that pastoralists are not owners of their land as far as they communally own it. They have no guarantee if the government or any investor needs the land and can be easily displaced, as they are not cultivating the land. This process is clearly happening on Karrayu pastoralists as different plantation farms are expanding their landholding restricting the dry season grazing land of pastoralists and their mobility. Hence, such clear marginalization of pastoralists on landownership by policy increase their vulnerability to climate variability and change

B. Development interventions

Up until the late 1940's and early 1950's the dominant land users of what is called the Fentale district and the Metehara plain had been the Karrayu pastoralists (Gebre 2009). In 1950s the imperial government under Haile Selassie endeavoured to gain control over the peripheral lowlands and to exploit the agricultural potentials along the banks of the 1200 km-long Awash River. After this period, however, several large-scale plantations, mostly managed by foreign agribusiness in joint venture with the State, were set up in the area. In 1962, the Awash Valley Authority (AVA) was created by the government as an autonomous public authority to administer and legally superintend all projects in the Awash valley (Said 1997). He further indicated that under this authority, developments in the Awash valley took the form of large scale mechanized commercial enterprises mostly managed by foreign companies in joint venture with the state. However, after the 1974 revolution, when the military power took power from the Imperial regime, all commercial farms were nationalized and managed as state farms after the 1975 Land Reform proclamation (Said 1997, and Markakis 2004).

Starting from 1968, when the Matahara sugar factory, owned by the Dutch firm Handels Vereniging Amsterdam (HVA), established for the first time on Karrayuland on Awash river near Lake Basaka, there are different investment activities in the area. In early 1970s, the upper awash agro-industry enterprise was established by government, which currently irrigates 5,892 hectares of land. This agro-industry comprises four plantation sites (Tibila, Nura-Hera, Merti and Jeju plantation farms) of which Nura-Hera is within karrayuland and Tibila, Merti and Jeju are located in the immediate neighbours of the Karrayu in agro-pastoralist Arsi Oromo. In addition to this, there is another irrigation farm in the Karrayu land, the Abadir fruit and vegitable farms.

As these investments are based on irrigation, they took away the dry season grazing land of the Karrayu. These areas are reserve lands of the Karrayu pastoralists, as they used to call it "our *Kaloo*[4]", which they used to graze it during the dry season for thousands of years. As one of my informants explained it, "it is difficult to explain how Abadir was important to us. No matter whether the drought was taking long time, Abadir is always wet. We migrate to Abadir during dry season. On the other hand other areas of Karrayu kept fallow and cannot be degraded due to overgrazing rather it afforests itself. When we move from Abadir to other areas of our land, Abadir afforests itself and vice versa". Abadir is not only the place used for grazing during dry season, but it was also one of the holy places for Karrayu where they used to celebrate the Gadaa ceremony.

Similarly the Nura-hera plantation was used as dry season grazing land. Currently, the Karrayu are left with few places of dry season grazing land (Arolle, Qararri, and Bulga river area), and this places are the conflict areas with their neighbours. These changes have together seriously affected the lives of Karrayu pastoralists through expropriation of grazing land.

C. Awash national park

The establishment of the Awash national park in 1969 on an area of 80,000 hectares (Said 1997, Abule *et al*. 2005, and Gebre 2009) has taken up large tracts of the dry and wet season grazing land and crucial sources of water of the Karrayu pastoralist. It is not only took their land but it has also become an important location of conflict between Afar and Karrayu as it is located between the two pastoralists communities, and sometimes with the park authorities as they capture their livestock. Pastoralists are allowed to some extent to graze their animals during extreme drought season, since the park is not fenced. As informants said, during the

[4] Kaloo refers to a reserve pasture, owned communally, that the Karrayu pastoralists community used to graze their livestock during the dry season.

dry season women are usually allowed to harvest grass from the park for their lactating cows. Hence, the establishment of this park also played an important role in expropriating the grazing land of Karrayu and limiting their movement, and also being the source of conflict, and increasing their vulnerability to climate variability and change.

D. Population pressure

The expropriation of land by Matahara sugarcane, Abadir fruit and vegetable plantation, Nura-Hera fruit and vegetable farm, and Awash National park on the one hand and, expansion of lake Basaka, bush encroachment, and government policy that marginalize pastoralists on the other hand have made the Karrayu pastoralists squeeze (or contract) on limited grazing land. This has created concentration of livestock and animal on the available wet season grazing land, leading to overstocking. The intensification of conflict in recent years has also increased the pressure on the remaining rangelands, while a substantial area of land (like Arolle, and on the banks of Bulga river) near the borders with Argoba and Afar remains a 'no man's land' because of fear of livestock raid.

Furthermore, increase in human and livestock population has created a pressure on the available grazing land. In addition to common high population growth in the rural areas of the country, the influx of migrants from the highland area in search of the employment in Matahara Sugarcane, Abadir fruit and vegetable farm, Nura-Hera fruit and vegetable and the current irrigation activity in the area has the main factor for the high population growth in the area leading to population pressure. As people who are employed in these farm and plantation are allowed to settle around the factories, they immediately engage themselves in buying livestock, and then looking for someone who can keeping their livestock around their work (in the surrounding areas of plantations and farms) because employees are allowed to have and keep livestock around the plantations and farms if they can. Hence, if a man or a woman is employed in the area, he or she brings within few days their relatives to keep for them livestock, and it is also traditional way of helping one's own relative's poor family, especially youths. In addition these migrants has also introduced different kind of sharecropping systems in pastoralists areas by collaborating with the local elders, where they farm the land and share the output based on their agreement. As one of my informants explains, "*in the past it is only Karrayu who is living in Fantalle district, except in small town of Matahara. But now, there are different ethnic groups living in the area. In the past, the number of people are small, but the number of livestock are many as a single household has many livestock. Currently, the*

number of people is many, as well as the number of livestock are many; because all people have livestock although the number of livestock a single family has is small".

As a result of all these pressures, the available grazing land are degraded, overstocked and became vulnerable to erosion due to high torrential erratic rainfall. This has made the Karrayu pastoralists more vulnerable to climate variability and change.

E. Lake Basaka

In addition to the above socio-economic factors that aggravate the vulnerability of the Karrayu pastoralists to climate variability, Laka Basaka also plays an important role in life of Karrayu pastoralists by taking a significant part of their grazing land. This lake, which they call it as *Nogoba* (which means useless), is expanding at an alarming rate over the grazing land in a recent years. It is useless because, where ever the lake reaches all plants and grasses dry out, and no livestock species or people drink the water. This might be due to, as Dinka (2012) writes, it is a "highly saline lake". Even though there are no quantitative figures that justify the expansion of the lake for the last few years, its expansion over the district is undeniable. For instance, the expansion of the lake is indicated by Dinka (2012) based on satellite images using remote sensing techniques starting from 1973 as to 2008. It is indicated that, in 1973 the lake covered 753 hectares of land, whereas it is expanded to 2943 hectares in 1986, 4168 hectares in 2000, and 4585 hectares in 2008 (Dinka 2012). There are different views on the source of its expansion. Some attribute it drainage discharge into the Lake and/or the groundwater outflow towards the lake, like Dinka (2012), while the community associates it the melting of the Basaka rock (black rock) due to the active volcanic activity of Mount Fantalle, and the surrounding irrigation, especially Abadir plantation farm.

During the field work, I witnessed that it is almost overtaking two pastoral associations (PAs): Galcha and Banti (typical grazing lands) as indicated on Figure 6 below, although it seems temporary. As the community say, the authorities tried to make a channel by hiring daily labourers to make it flow to river Awash to protect and bypass from the Matahara town by digging by hand. By expecting it will flow by itself to the river of Awash, they stopped in the middle way by bypassing from the town. Contrary to the expectation of the authorities, the water diverted from the expected direction and overflows the PAs. However, it is clear that the authorities are well aware that if the water from the lake joined the river, it affects the downstream irrigation projects in the lower Awash basin and affecting the livelihood of the people depending on the water resources of this basin due to its salty

nature. Hence, the stoppage in the middle of the pastoralist area is seems purposely, to protect the town.

Figure 6. Figures showing the overflowing of Lake Basaka in town of Matahara (A) and neighbouring Kebele (Galcha) (B).

F. Bush encroachment

Another major problem is an exotic invasive species. It is indicated in the Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) document of Ethiopia that rangelands across the pastoral areas of the country are increasingly encroached by thorny shrubs and unwanted trees. The document estimates that invasive weeds and bushes erode grass fodder availability in the pastoral areas at a regressive rate of at least 0.5 percent annually (MoFED 2006). Bush encroachment is particularly severe in the study area. Abule et al. (2005) identified some of the main encroaching bush species in Karrayu and Afar pastoralists' area as Acacia nubica, Acacia senegal, Acacia mellifera, and Prosopis Juliflora (*Woyane Zaf*). Furthermore, they write that other non-woody plants such as Cryptostegia grandiflora (*Haqonqol*), Tribulis terrestris (Kumeto), Parthenium hysterophorus (*Ali Wario*), Capparis fascicularis (Harangama) and Datura species were also indicated to have increased.

The most dangerous invasive species identified by the participants and informants in the Karrayu pastoralist area are *Woyane Zaf, Hoqonqo*, and *Ali Wario*. As my informants and group discussion participants indicated, the expansion of *Ali Wario* is decreasing. There were also different interventions taken by different institutions to bring it to this level. However, all interventions that have taken by the community as well as by different organizations (including the government) against Hoqonqol and Wayane Zaf were and are not successful. These two invasive species are expanding at an alarming rate. They are poisonous and out compete other species. No other plant can survive especially with Woyane Zaf.

Hoqonqol causes bloating and can kill animals when eaten unfortunately with other plants. The seeds of Hoqonqol, upon consumption, cause continuous diarrhea and paralysis leading to the gradual death of the animal. Woyane Zaf causes animal mortalities when the leaves are eaten, and when the thorn is get in to the foot of animals. It paralyzes the legs of the animals and leads to the gradual death of the animals.

Participants in focus group discussion has indicated that compared to the past, their grazing land is now covered with bushes and shrubs, which caused a decline in rangeland condition, decrease in grass production, and difficulty in herding (as it is not easy to pass through it). This expansion of unpalatable and thorny species undermined the extent and quality of rangelands leading to the loss of palatable and nutritious indigenous grass species (like *saardo*) and browsing species. According to informants and focus group participants, the loss of these species has reduced milk yield and quality while also exposing their livestock to diseases as discussed above. The encroachment of bush and weeds on potential grazing lands affect the productivity of rangelands, and make the pastoralists vulnerable to climate variability and change.

G. Conflict

The Karrayu pastoralists are in conflict over their resource with different groups. They have been in conflict with the Argoba agro-pastoralists, the Afar pastoralists, and sometimes (on access to park area) with government. Most of the conflicts over livestock and access to water or grazing land are a consequence of resource scarcity (feed scarcity) and recurrent drought. Most of the conflicts are instigated during the dry season grazing period over grazing land. In a focus group discussion participants stressed the frequently increased (intensified) occurrence of conflict with different groups or communities in recent years. These conflicts were especially related to shortages of water and good quality grazing lands. Conflicts not only cost lives and resources, they also constrain the mobility of pastoralists, thereby leading to underutilization of range land resources and reduced livestock productivity and increasing food insecurity.

There are different drivers of conflict that cause vulnerability to climate variability and change in the study area. Livestock rustling (livestock raiding) and competition over dry season grazing land are main drivers of conflict with their neighbouring pastoralists and agro-pastoralists. Bulga river and its surrounding dry season grazing land is now a bone of connotation between Afar, Karrayu and Argoba. As informants said "*it is 'our' dry season grazing land. When we go there, they also come to graze on their side. They steal our*

livestock, and our children, who are keeping the livestock, start fighting to take back the lost livestock."

In a similar way, one official informant said it as *"it is true that the Karrayu pastoralists are in conflict with their neighbours over grazing land around Bulga river. While these pastoralists graze peacefully on their own side, if one cattle is missed due to raid or whatever, those who keep livestock suspect each other and started fighting due to the long standing revenge*". It is in this way then, the conflict involves the whole clan and later, the whole community. Due to this, the grazing land remains ungrazed, or in most cases as "no man's land", which if peacefully used, helps them to resist the drought due to climate variability. Surprisingly, the official authorities from any side are not willing to solve the problem; for one thing due to a sense of feeling for their own community to control the area as the boundaries are based on ethnicity, and for the other thing is due to the complicated nature of grazing land rights in the area.

Sometimes, livestock raiding is also done by plan. In this case, as it involves raiding of significant number of livestock, it has a more pronounced social and economic impact on the household. Most of the time, the targets are the richest (those who have large number of livestock) households. The raiding is also more serious when it involves the raiding of camels, as they are most socially valued, most expensive, and relatively drought resistant. This loss of camels complicates the social relationships, as it increases the escalation of tension and rate of revenge. As informants said, "if a husband of a household who's livestock is stolen is not preparing a group and leading for revenge, his wife will divorce him." This shows that, the intensification of conflict due to revenge involves the whole family. If the raiding of livestock or physical attack is not revenged, the household as well as the clan feel profoundly humiliated. Hence, actions of revenge are positively welcomed by the elders as well as by the whole Karrayu community. This tension induced by conflict between the ethnic groups, limits free movement and interactions in order to effectively use the available resources. In addition to livestock raiding and competition on dryland grazing resources, the expansion of marginal farmers onto their grazing land is diminishing their land.

To summarize, this section has analyzed how vulnerability of the Karrayu pastoralists' community has increased to climate variability and change. The PAR model is used to show the progression of vulnerability of Karrayu pastoralists at three levels: root causes, dynamic pressures, and at risk factors. Government policy and development interventions are discussed in detail as root causes; whereas Wildlife Park, population pressure, Lake Basaka and bush

encroachment are discussed as dynamic pressures; and finally conflict is discussed as at risk factor. As pointed out in the beginning, the recurrent drought due to rainfall variability is a perennial risk to Karrayu pastoralists, which they have used to it for thousands of years. Hence, the hazard component of the PAR model (which is drought in case of my study area) is not discussed, as the current and emerging concern for the Karrayu pastoralists are those factors discussed above that generate their vulnerability by dispossessing their grazing land (and especially their dry season grazing lands), by limiting their movement, and taking most productive lands along the Awash river and their riverine forest, then squeezing (or contacting) their land and leading to overgrazing of the available grazing land due to population pressure. The Karrayu pastoralists are also responding to their vulnerability by taking different adaptation and coping strategies. Hence, in the next section, I discuss how the Karrayu pastoralists community have adapted to climate variability in the past and present, and consider how this adaptations relate the drivers of vulnerability.

5.2 Adaptation

Traditionally, the Karrayu pastoralists have been adapting to their natural environment through access to and management of communal rangelands, mobility of livestock, and mutual assistance system. However, within the changing conditions, these systems of adaptation have been under continuous threat and change, and other systems of adaptation are taking place. In the following section, I discuss the adaptation mechanisms that the Karrayu pastoralists are using to climate variability and how it is changing.

5.2.1 Mobility

In the arid and semi arid region, livestock production requires constant or periodic movement in search of pasture; a factor that differentiates this form of livestock production from those practiced by farmers and ranchers (Markakis 2004). Movement of animals in response to spatial and temporal variation in resource availability is perhaps the most classic of all the tracking strategies, and is central to survival strategy of transhumant pastoral systems (Sconnes 1995). Movement allows herders to track fodder across the landscape, making use of pitchy grass production caused by uneven rainfall or variations in landscape topography. Rather than manipulating herd in response to climate variability, as would a rancher operating in enclosed area, pastoralists move and shift their resource endowments (Behnke and Kerven 1994, Hogg 1997). Efficient tracking requires movement over different scales depending on the temporal and spatial pattern of primary production variability (Sconnes 1995). Marin

(2004) argues that tracking is an adaptation strategy developed by pastoralists to environmental variability by adjusting their number of animals (pre-emptively or collectively) or by moving their livestock to where resources are located.

As discussed in the background, the Karrayu pastoralists have been and still leaving in lowlands of Middle Awash River valley for centuries and years. Their livelihood was based on pastoral nomadism. Mobility was one of the traditional coping and adaptation strategies of the Karrayu pastoralists. They have dry season and wet season grazing lands. The dry season grazing land is known as *Kaloo* by the Karrayu. This *Kaloo* is managed by the community and it is owned communally. Traditionally, this communal ownership of the range was an adaptation to climate variability. Without permission to access to a wide variety of potential grazing areas no pastoralist could be assured that his livestock would find grazing when they need it. This access was regulated by social organization of the community, such clans, sub-clans, and neighborhoods, who were jointly responsible for range condition.

As my informants and focus group participants explained, Nura-Hera area, *Naannoo Abaadir* (Abadir area) and along the banks of River Awash were the most popular *Kaloo* areas of the Karrayu. In addition to these areas there are places like *Tututii* and *Qaraarii* which are grazed during the dry season. Hence, in past times mobility was the best coping and adapting strategy to drought (rainfall variability) for the Karrayu. Even though it is limited, mobility is currently one of the coping and adaptation strategies to climate variability and change. The loss of the Nura-Hera and Abadir area to the state for state farms is a pick point for their restriction of mobility, as the focus group participants revealed. The loss of these dry season grazing lands, including those of the Matahara sugarcane plantation, and Awash National park, forced the Karrayu pastoralists to diversify their livestock composition, especially from cattle to camel and goat. However, there is still mobility, although the nature of mobility differs from the one they used in past times. The camel households are as mobile as far as *Bosset* and beyond; whereas the cattle households are limited within the Karrayu owned land, Fantalle district. There is no clear explanation from the official key informants as well as from the community why the camel is allowed out of the district and that of the cattle is limited within the district.

Similar to Borana and Afar pastoralists, in stressful period (eg. drought), the Karrayu pastoralists also kill calves in order to ensure the survival of the lactating cow. In addition to this, a significant proportion of the livestock may be slaughtered and sold in the hope that the remaining pastoral resources would ensure the survival of the remaining herds.

5.2.2 Diversification

Diversification is an essential component of pastoral livelihoods to cope with varying and unpredictable resources. Pastoralists practise multi-species herding, enabling them to utilize different herding environments (Oba 2013). The Karrayu pastoralists were known as cattle pastoralists. However, due to squeezing (or contraction) of grazing land, shortage of grass (even on the available grazing land), and increased frequency and impact of drought, they are now diversifying their livestock, herding cattle, camel, goat and sheep. Due to the intensification of the problem of the grazing land, they now prefer shoats (especially goats and sheep) and camel to cattle. This is due to the fact that camels and goats are more resistant and less vulnerable to drought compared to cattle and also have different fodder preferences, preferring browse to grasses. Such diversification helps to increase their adaptive capacity to climate variability and change. The market demand for camel, as compared to cattle is also high. More generally, the Karrayu now consider shoats as "pocket money" as their market demand is high and easily sold on the market. In addition to this, focus group participants said that "goats and sheep are easily managed on the available grazing land". Several factors play a role in driving the process of diversification in Karrayu pastoralists, including drought and famine, population growth, loss of common property resources, commercialization of economy, sedenterization and urban migration and political turmoil and conflict (Fratkin 2013).

In addition to diversifying within their livestock, the Karrayu pastoralists have started diversifying their livelihood by taking "opportunistic farming". In past times, farming is considered as taboo in Karrayu community. As discussed in the background, there is still a sort of filial reverence to the Earth which is deemed too sacred to be pierced by hoe or the plough among the Karrayu community, especially men. Besides, from the point of view of the Karrayu, it was the poor (destitute) pastoral household who was taking part in cultivation.

However, currently the perception of the Karrayu community towards farming has been changing: as one of my official informants explained it *"..., such kind of perception was created by people. And there are still some people who do not want to see the Karrayu pastoralists changed. However, through the extension work done by the government, that perception is not within the community now. They are farming three times a year using irrigation"*. Even though the view of my informant is more of political, there is cultivation within the karrayuland, especially around Dire Saden area. However, still the wealthy pastoralists prefer pastoralism (herding their livestock) to cultivation. Gebre (2009) writes that *"the continued expansion of the Metehara Sugar Estate kept displacing the Karrayu pushing*

them further and further until they reached the Dire Sedan peripheral area covered with bushes and forests. Members of the Ittu and Chore groups introduced farming in this area by clearing forest lands and hoeing the ground until they later started ox-drown cultivation since 1985". It is in this area that the Karrayu also started this opportunistic farming. Currently, Dire Sadan area is the PA where this opportunistic farming is intensified.

It has been argued that *"there is little question that pastoralists will continue to diversify their incomes and assets as buffers against risk (especially drought-related), forms of investment, and means to supplement or replace livestock based incomes"* (Little 2013). However, the nature of income diversification in pastoral areas is complex. It can be, as Little (2013) argue, survival type (like casual unskilled labour and petty trade) or accumulation type (like retail business and real estate investment) diversification. Similarly, income diversification strategies can be supportive of pastoralism (such as milk and hides and skin trade) or they can be competitive or even harmful to pastoralism (for example charcoal making and firewood sales) (Fratkin 2013, and Livingstone and Ruhindi 2013).

As my informants and focus group participants have explained for me, the issue of income diversification was not a real issue in past times. Because they used milk (and milk products), meat and other wild fruits from riverine forests and elsewhere from the Karrayuland for consumption. Their wealth status was only counting the number of livestock they have. Their expense for other things is insignificant. However, due to the change in their environment because of rainfall variability and other external interventions that makes them loss their livestock population and quality, resulting in los of milk and milk products on the one hand, and on the other hand due to modernization (like sending children to school and covering expenses, buying cereals for consumption, and buying modern clothes leaving their traditional cloth, locally called *Marxoo*[5]) their expense is increasing; and hence income diversification is an issue now. Presently most forms of income diversification of the Karrayu pastoralists are pursued out of desperation and are survival-based. These include selling livestock (especially Shoats) to buy cereal crops for consumption, to support their milk consumption; making charcoal; and petty trade. The relatively wealthier households, especially camel owners, indirectly pursue non-pastoral investments and activities, like trade, with the goal of supporting not replacing or exiting pastoralism.

[5] Marxoo is a traditional garment worn around the waist by Karrayyu community.

The decline in the welfare of pastoralists will not be halted or reversed by focusing only, or even principally, on livestock-based pastoral livelihoods. Diversification into other production options-creating alternative livelihood pathways-is essential (Sandford 2013). Diversification in pastoral areas is already happening fast and affects different social groups in different ways (Fratkin 2013). The driving forces (factors) for diversification may include destitution as well as wealth, and the search for crisis survival options as well as opportunities to invest and accumulate. The poor pastoralists have been forced to diversify out of livestock herding, in activities like charcoal making and firewood sales, which offer them minimum returns. Devereux (2010) also argues that the returns to rainfed cropping in pastoral environment are low and uncertain and continuing the switch from pastoralism to cropping will become less and less feasible as climate change worsens conditions. On the other hand, Sandford (2013) argues that opportunities for an (ex-) pastoralist in irrigated agriculture in their own area will be favourable, and the reward relatively attractive. However, the experiences of irrigation from pastoral areas of Ethiopia (for instance in case of the Cotton irrigation farm of Afar Region) indicate that irrigation is a failure. In case of cotton farm in Afar pastoralist areas, "*the owners abandoned the land after some years, after that the land is left bare without any use*" (Said 1997). Hence, the success or failure in the intensification of opportunistic farming and irrigation activities (which will be discussed in detail under government response) in Karrayu land is what we will see in the near future either leading the whole Karrayu to prosperity or leaving them on the abandoned bare land.

5.2.3 Traditional support systems

Communities have their mutual support systems. Usually these systems are embedded in local (or traditional) institutions. Tache (2008) argues that institutions of mutual support are common among pastoral communities of Eastern Africa, although their method differ across communities, depending on the system of social organization of a particular group. For instance, citing Sato, Tache (2008) writes that "the Rendille of northern Kenya implement resource redistribution through age set cycles"; whereas among the Borana Oromo, cattle redistribution is set within the context of clan organization (Tache and Sjaastad 2008). The Karrayu community has a clan-based mutual support system through which they help each other. Traditionally, there is a mechanism through which they share resources, "*Walgargaarsa"* (literally translated, Supporting each other). Under the Gadaa institution, all leaders of the clan are responsible to know the status of their community members. Tache and Sjaastad (2008) in their study of "Mutual Assistance and Poverty Reduction among Borana

Oromo: The Institution of Buusaa Gonofaa" argues that the purpose of social institutions is the appreciation by the society that self reliance could be lost at any time and that individuals do not have sufficient capacity to buffer themselves against such losses. Hence, being rich or poor is not necessarily predictable or rational. In the Karrayu pastoralists, wealth (rich) is based on livestock possession. However, during drought or conflict or any other extreme event the rich is more affected and is also more a target by the "enemy". Thus, every member of the community in a clan was positive to help each other as soon as the support is approved by the clan leader.

It is interesting to listen to people (informants and focus group participants) when they talk about the past with full of smile, on the one hand, and on the other hand very sad to see their face with complete change to talk about their current status of their mutual support system. Most of my informants and participants have experienced the past situation of their community. If one household lost cattle due to livestock raid, or unfortunately attacked by diseases severely, or drought, the leader of the clan calls up on meeting for the whole clan and declare that the specified household has to be supported immediately because the lose is not due to the failurity of the household. The members of the clan contribute for the household what they like (cattle, camel, goat or sheep) only based on their interest; even though contribution is a kind of obligatory. Hence, within a day, the household gets a lot of livestock. The Karrayu herdsmen, especially those with large number of livestock, are very aware of their being victim to many things (raid, disease, and drought). Hence they are the ones who are kin to this kind of resource distribution; for one thing is to get support at anytime from the community and for the other thing is to build the sense of belongingness within the community. In addition to this resource distribution, in the form of live animals to those who lost their livestock, those wealthy households are also pioneers in feeding their people. As of one of my key informants: *"In those times, those who have cattle, they feed our people. They slaughter cattle and goats and feed all the community. By doing so, they got support. You also do it another time. ..... Now it is history. No enough cattle or goats to slaughter and feed the community. We think of to sale the cattle and goats to feed our own children and pay their school fees, and so on".*

Sharing is also not limited to livestock and livestock products. Interestingly, the Karrayu community also shares from what they bought from the market, especially food crops. In the past, when a household buys crops, it was not expected that the household eat alone. Rather, the household makes porridge and calls its immediate neighbour and eat together. One informant, referring back to when he was young, said that:

"In those times, if one buy crop (cereal) for his family, the whole people call each other and go to that person home, and it was so funny that everybody share it, from the cooked one (porridge) as well as from the cereal itself, especially women. We eat that as a celebrity, as we wished (eager) to eat it. It is not for our daily consumption, this could happen in several months, or even in a year. We call it a neighbourhood has bought, let us go and eat porridge. They welcome us happily. Because this is not begging, it is our tradition. They also call people in their way to their home by saying we bought (cereals from market) today, let us eat porridge. This is our respect for each other. Everyone goes and have his wished (eager) food. On the other hand, women go for loan (which is to share cereals that the other household bought). And they cook it for their family at home, especially for children. We just lived together by eating like this. Now, no one does this".

Another informant also appreciated their traditional system of helping each other, but stressed on how and why this traditional system of helping each other is weakened, as indicated in the following quote:

"We used to help each other in previous times, but now people are not willing to help each other. The government brought back as a fashion that we used to it by renaming it "*Garee*" (group) and "*Goxii*" (sub-group). The government tell us to unite and build in *Garee* and *Goxii*, and to work as a group. But there is nothing to work and no place to work (the available land is not suitable for any kind of work). We did different things by *Garee* in those times. The thing is that people who do not have anything in his home will not go for *Garee* to work for another. In those days when we work for each other by Garee, we have milk, butter, meat, and different edible fruits of plants. Now, these all are scarce to our community, hence people will not go to save your children while their children have nothing to eat tomorrow. If we (individually) have something for ourselves, we go in group for other. A man who does not have something for himself today, he does not go for the other with the group. A man that does have something for himself will go for the other with *Garee*, and the other way is not the case. If I go for Garee (group) today, what can I feed my kids or family tomorrow? We know Garee in those days. We do not go for Garee because we do not have our own for tomorrow".

Today, the mutual support systems are constrained by the escalation of poverty and conflicts, decrease in the number of livestock a household have, increase in the number of households who lose their livestock due to conflict, drought and disease, individualistic development in the people (contrary to their tradition) due to 'modernization', weakening of Gadaa system which used to govern the people under one umberella, unwillingness of some individuals to respect the rules and regulations of the traditional institution and going for the ruling

government. These all limits people to support each other under their traditional institution, particularly in the face of climate variability and change.

4.2.4 Household division

During the periods when the Karrayu had different dry season and wet season grazing places, the whole household (or community) move from one place to another with their livestock. Especially during the dry season grazing periods, it is at most important for the whole household to move with their livestock, as the movement involves to distant places in search of pasture and water, and transportation of milk for the household is difficult and has also sever consequences. In the far past, the whole livestock group moves together with the household, and the majority of the livestock composition were also cattle. However, with the change in time, and the expropriation of their land for different uses as well as due to lack of pasture (grasses) on the available grazing land (as explained above under diversification), the Karrayu pastoralists are forced to change their livestock composition from cattle to camel and goat.

As this was also not sufficient in sustaining the community for various reasons, as explained under the vulnerability section, the Karrayu pastoralists are currently divided their households in to two in order to cope with and adapt to the changing conditions, mainly climate variability and change. This new system of coping and adaptation strategy involves the division of a household in to mobile household (commonly known as camel household) and a sedentary household. Those household groups known as a camel households compose youngsters, mainly boys, whereas those sedentary households are women, children and very old people. This kind of household division is much more practical and stronger among the relatively well to do households, who has cattle, camel, goat, and sheep. It should also be noted that much of the well-to-do families in the Karrayu community are polygamous. This division of household is also helped the Karrayu community, especially those separated their cattle, goat and sheep from camel, against drought and diseases. Hence, household division helped them to allocate the human capital appropriately between the divided households so that they can cope with and adapt to climate variability and change.

It is noted from the group discussion that those young camel households, male youths, are responsible for tending the community's livestock (especially camel and few cattle) in distant migration areas and ensure that the animals are provided with the most suitable grazing available, in order to secure sufficient number of animals. The keeping of the camel at a distant place in search of browsing plants sometimes involves movement outside their

district especially towards *Bosset* district and other districts mainly occupied by Oromo. This is due to the fact that during the dry season (winter season), the agro-pastoralists are not cultivating the land and the pastoralists can move their camel on their land to search for browsing plants. Youths are also responsible to milk the camel and store, so that when elders or clan members come to visit them can take it back for the settled household. This responsibility requires youths to stay away from the household, who are settled, for a prolonged period of time. They are on a constant and extensive movement searching out pasture and water for the livestock in a largely hostile natural environment. This responsibility is much more challenging for the youths during the peak of the dry season and periods of drought, which frequently occurs.

In addition, the camel households are also responsible for two important aspects; on the one hand, to protect the land from the expansion of their counterparts, especially Argoba and Afar, and on the other hand to expand and secure their own territory over the disputed areas by any chance they got over the others. As the movement is basically towards the territories of other pastoral groups, where abundant forage is available due to the fear of the conflict over boundary, they have to prepare themselves for armed counters with pastoral groups competing for the same scarce life-sustaining resources. As Gebre (2009), in his study of Intergroup conflict, the role of pastoral youths and armed proliferation in nomadic areas of Ethiopia, indicated *"the encroachment of pastoralists in to the turfs of neighboring communities in a continuing pursuit of suitable forage inevitably pose the risks of armed confrontations and hostilities, which usually develop into bloody inter-group conflicts"*. As realized from the focus group discussions and key informant interviews, youths are grown up from their childhood by hearing the responsibility from their family, elder brothers, peers, and community in general. Hence, youths from every household wants to pass through these responsibilities.

It is undeniable that this kind of responsibilities requires strong social institutions. For instance, when there is a suspicion of conflict eruption, every member of the community is ready to deliver or provide weapons, ammunition and food for youths who are confronting the counterpart to defend the boundary of the community in general and secure suitable grazing for their livestock. These help the Karrayu community to develop social cohesion and mutual solidarity within and between clans. However, there is a sense of fear within the community elders due to the weakening of such solidarity because of the lack of sense of responsibility by the youth. This is happened due to the interference of the external bodies (NGOs and government) in to community. For instance, NGOs provide free education and training for

youths in different activities other than pastoralism (will be discussed later). Whereas, the government cadres are organizing youths in the rural area under small scale enterprises by providing them funds, which is more for political purpose.

The settled households, especially after the intensification of opportunistic farming and lately after the introduction of large scale irrigation project in 2009, are engaged on farming and irrigation activities-especially onion production as indicated on Figure 7 below. The responsibilities of the settled households are basically on women, and it increased the workload on them. As the camel milk is not nearly available, the women are responsible to provide food for their household by any means. With regard to this, the Ethiopian Herald (2012) writes as *"at a national consultation workshop on gender, climate change and agriculture support programme, which is aimed to sharing findings amongst key stakeholders of five pilot countries chosen for study, findings of the Ethiopian case study revealed that women are found to be the first victims of climate change due to discrepancy between policy and institutional leadership"*. Hence, owing to their gender-specific responsibility for the well-being of the family, they are more engaged on other income generating activities like charcoal making in addition to opportunistic farming and some on irrigation activities. This is to balance the unavailability of sufficient amounts of camel milk during the dry season with cash income in order to be able to buy grain.

Figure 7. Pictures taken at Dire Saden, showing onion production by irrigation and keeping of livestock around the irrigation (to the left), and the one to the right indicating the irrigation water is also used for livestock drinking.

The small children also have duties. While their mothers (women) are working on irrigation fields, children keep calves, sheep, goats and some cattle around the irrigation vicinity. This is to get advantage of the weeds from the irrigation product, wet grass around the irrigation, and

drinking water for their cows. Regarding this settled households, my key informants from the government offices, consider as the opportunity that the government provided for the pastoralists by irrigation activity. However, most of my key informants from the community reveal that farming in general is introduced due to the problem our community faces.

To summarize this chapter, this first section of analysis indicates how the Karrayu pastoralists' community became vulnerable to climate variability and change and the adaptation strategies adopted by the community. Based on the Pressure and Release model as discussed earlier, the analysis indicates the progression of vulnerability of the Karrayu pastoralists at different levels ranging from root causes to at risk factors. Similarly, the Karrayu pastoralists community are also responding proactively to their vulnerability by taking different adaptation and coping strategies as discussed above. Hence, the answer to the first research question which says *"what are the socio-economic conditions that create vulnerability to climate variability, and how do the community cope with or adapt to it and how is this changing?"*, is that government policy, development interventions, wildlife park, population pressure, and conflict over resource use are the main socio-economic factors that cause the vulnerability of the Karrayu pastoralists to climate variability. As discussed above, these factors are limiting the traditional coping and adaptation strategy of the community that they used to it by moving between the dry season and wet season grazing lands, through the expropriation of their dry season grazing lands and riverine forests.

The Karrayu pastoralists developed different coping and adaptation strategies. Traditionally, they have been adapting to climate variability through access to and management of communal rangelands, mobility of livestock between wet season and dry season grazing lands, mutual assistance systems under their traditional institution, and fruits of plants from riverine forests. The expropriation of their key resources has led to the loss of their dry season grazing lands and riverine forests which affected the productivity and quality of their livestock, as discussed earlier, and therefore affecting their milk and meat consumption as well as wild fruits from the riverine forests and elsewhere from the karrayuland. This has forced the Karrayu pastoralists to change gradually their adaptation strategies by diversifying their livestock composition (shifting from cattle to camel and goat), diversifying their income (through charcoal making, firewood collection, selling sheep and goats, and petty trade), taking "opportunistic" farming, and dividing their households in to two: as mobile camel household and settled household.

6. Analysis II: Responses

This chapter analyzes the external responses given to the vulnerability of the Karrayu pastoralists' community to climate variability and change by government institutions and nongovernmental organizations. The Institution, Adaptation and Livelihood framework is used to analyze whether the responses by these external bodies are developing or destroying the adaptive capacity of the Karrayu pastoralists' community. As discussed earlier, the Institution, Adaptation and Livelihood framework is used to examine the relationship among vulnerabilities, adaptation practices, institutions and external development interventions. The analysis presented in this chapter addresses the second research question (*what are the roles of government institution and non-governmental organizations in developing or destroying the adaptive capacity of the Karrayu pastoral community and how has their involvement affected the community?*). The findings from the fieldwork are combined with the contextual analysis of the literature to illustrate how the adaptation practices of the community are influenced by government institutions and nongovernmental organizations interventions in the study area.

6.1 Government responses

Compared to the previous two regimes, the current regime of Meles Zenawi, which has been in power since 1991 is taking different responses in pastoralist areas. As different informants specified, in the past two regimes, the most common intervention was emergency response. Both past regimes had given the community wheat after disaster was happened. However, the informants stressed that, in the past regimes the frequency of drought (and consequently famine) was not that much severe as it is today. The present regime is taking different measures before disaster is happening which include early warning system, disaster prevention and preparedness, and asset building. However, most of the sector offices working on these measures are suffering from poor organization, limited human and material resources, and lack of networking with other sector offices. Emergency responses, as used by the past two regimes, are also most popular responses by the current government. As informants revealed, when the disaster is beyond the capacity of the community the government provide emergency responses.

Currently, conditions are very complicated on Karrayuland. The frequency of drought is increased. Conflict is happening frequently. Land is being taken at an alarming rate by different development agents, some of which are already there in the past two regimes and expanding their investment by grabbing land faster in the current regime. Rainfall is highly

variable. People are losing their assets and key resources-pasture, riverine forests, and dry season grazing lands. It is also argued as "the country has no an explicit policy on climate change yet. Most policies and strategy documents hardly captured the threat of climate change as a development agenda" (Amsalu 2009). It might be due to these recognition of complex factors on the Karrayuland that the government is taking different responses to develop the adaptive capacity of the community to climate variability and change, by using external funds from USAID and World Bank. However, whether the responses of the government are helping the community to adapt to climate variability and change or increase their level of vulnerability is a question of time. In the following subsections, I discuss three most important interventions that the government is making in response to climate variability and change, on the Karrayuland for the community: Irrigation, Resettlement and Productive Safety Net Programme. However, since irrigation is the most important intervention in the area, many aspects of irrigation also will be discussed.

6.1.1 Irrigation

During the fieldwork, I found that there is a big move towards the large scale irrigation project to transform the Karrayu pastoralists to agro-pastoralists based on irrigation activity in response to climate variability and change. Data obtained on irrigation activities in the area from key informants based on interviews varies slightly. Interviews with government official key informants indicate that, "the Karrayu is no more pastoralists, as they are engaged on farming based on irrigation the government provides for them". They emphasize that irrigation is the most important and achievable response to climate variability for the Karrayu pastoralists' as there is a big Awash river crossing the district as indicated in Figure 8 below, and it has been under construction based on the fund of Climate Change National Adaptation Programme of Action of the country. The views from the community key informants are also similar but slightly different. Key informants from the community and focus group discussions participants emphasize that irrigation (and farming in general) is introduced in their land to alleviate their problem, "but so far we have not seen a significant change".

This finding is consistent with findings in the literature. For example, Muller Mahn *et al.* (2010) writes that during the past 15 years, some Karrayu have settled and taken up farming owing to the expansion of irrigation agriculture in areas along the banks of the Awash river. He added that they settled in the surrounding area of Matahara town in an attempt to claim the land and to prevent further encroachment by the state farm or migrants from the highlands. Little (2013) reflect generally on pastoralists in East Africa by saying that

"agriculture increasingly is advocated as a key alternative for the poor and a supplement to pastoralism for better-off households, but it raises certain challenges. Most important is that rain-fed and irrigated agriculture is not feasible in many dry rangelands". Similarly, Sandford (2013) argue that *"interventions by outsiders to irrigation in pastoral society - by government or international organizations, NGOs or commercial companies - over the past 50 years have a chequered history. Some of the failures occurred in cases in which the intended role of pastoralists was to be operators of small irrigation farms"*. For instance, Vertanen and Gemechu (2011) indicate that instead of mobility, the current Ethiopian government's development policy promotes irrigation schemes as incentive for pastoralist sedenterization, which is favored as a means to reduce resource conflicts and facilitate service delivery. However, these authors have concluded that, these irrigation projects which are part of the National Adaptation Program of Action (NAPA) projects, which are expected to contribute to climate change adaptation through poverty reduction and improved food security are almost totally invisible.

Different authors indicated the status and liabilities of irrigated agriculture in the Awash valley. Michael and Sileshi (2007) write that the Awash valley contains only 4 to 5 percent of all the land area that is suitable for irrigation in Ethiopia, and over a third of all the Awash valley irrigable land is already irrigated. They added that "some of this land has also been under irrigation for four or five decades and long-term effects are now apparent", as some of the land is abandoned due to soil salinity. For instance, Behnke and Kerven (2013) reveal that much of the riverine forests that once supported traditional Afar pastoralism have been bulldozed under and replaced by irrigated or abandoned fields. These authors further indicate that it is difficult to conceive of these areas - many of them now damaged by soil salinity and bush encroachment - ever returning to natural vegetation and pastoral use. Similarly, Said (1997) disclose that all types of salinity have been identified in the Middle Awash Valley and the problem is present to varying degrees in virtually all the irrigation projects. He indicated that up to 1990/91 a total of 3440 ha of irrigated land had been abandoned due to salinity and/or sodicity problems on the different schemes in the Middle Awash Agricultural Development Enterprise (MAADE). He further writes that data available in MAADE indicates that the rate of abandonment of land use to salinity has been increasing every year since 1982/83.

Despite different views by scholars the government of Ethiopia is currently engaged in conducting different irrigation projects in lowland areas of the country as a response to climate variability and change. Most projects are conducted by NAPA of the country and its

partners, in response to climate variability and change. Some of the projects include the Wabeshable irrigation project, the Genale-dawa irrigation project, the Dabus-Dhidhessa irrigation project, and the Fantalle-Tibilla integrated irrigation project.

The Fantalle irrigation project, which is part of the Fantalle-Tibila integrate irrigation project, is intended to make the Karrayu pastoralist community in Fantalle district food secure through irrigation, as indicated in Figure 8 below. One interesting thing of this project is that, it is to benefit the Karrayu pastoralists community in response to climate variability and change, contrary to the past irrigation history of the country which was for commercial purpose. In the following section I discuss some of the processes involved and challenges come with the irrigation project in relation to the Karrayu pastoralists' community.

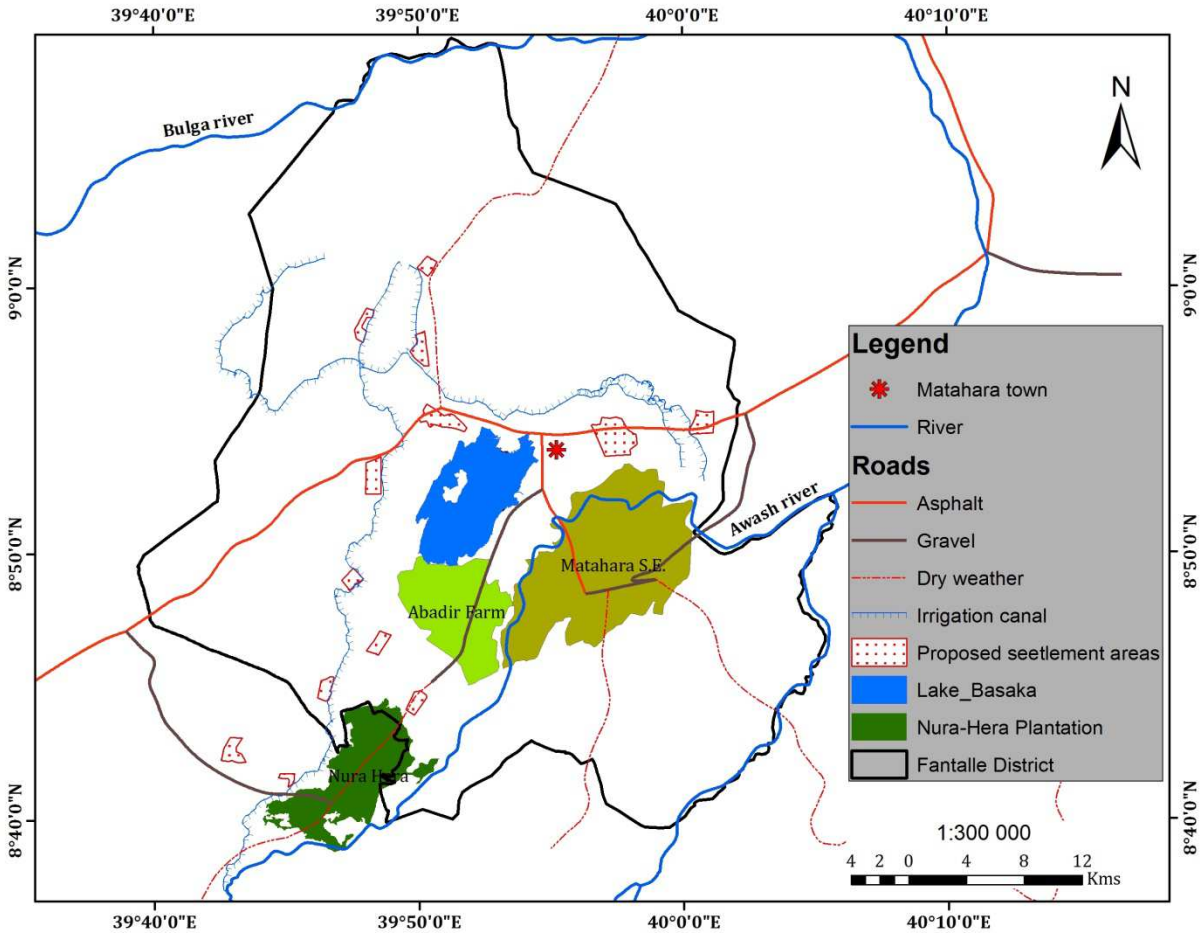

Figure 8. Map showing the settlement plans and irrigation scheme in Fantalle district for the Karrayu pastoralists' community (Data Source: OWWDSE 2010, and mapped by the Author).

A. Land distribution

The government, through its district administrators, is conducting grazing land subdivision and titling in some selected PA's to distribute for pastoralists so that they settle and cultivate

using irrigation. It is clear that the main driving issues are resettlement of pastoralists and privatization of land; however the government is using irrigation as a means (or tool) to convince the Karrayu pastoralists. The government has a plan to resettle 1.5 million households who are mainly pastoralists from lowland areas of the country. The land distribution has started in Karrayuland in 2009. The Fantalle-Tibila integrated irrigation project is still undergoing in land distribution process. The distribution has three categories: for those who have family, for those who are married but without children, and for youth males. For those household with children, 0.75 hectare of land is given, while those married household without children and male youths, 0.5 and 0.25 hectares of land are distributed respectively. The distribution is still not over and it continues with the place where irrigation reaches.

Even though the process is on progress, there are many problems and challenges observed from what has been done so far, as witnessed during the field work. For instance, as informants and focus group participants revealed, the land distribution is not really for the pastoralists at large. "They are taking our land in front of our eyes", said one of focus group participant. Either due to greedy and selfishness or lack of awareness and information, the majority of the land of the pastoralists are distributed to government employees; hence the advantage goes to the other direction rather than the intended plan. The government employees got land from different PA's and one of my informants told me that they distributed the land for themselves until 2 hectares, whereas some of the pastoralists did not get the land and the rest of us are restricted to 0.75 hectares.

This anger of the community is not without reason and it is not a blinded complaining. While I was conducting my field work, the district administration is redistributing the land again. The reason for redistribution is due to two problems related to land distribution: the first is, the complaint by the community that local authorities are taking land at different PA's by collaborating with distributors, and the other is, as the district administrators say "that the distribution is not considered the women in a family". As the district administrator explained to me the issue in the field, "now we are distributing the land by taking both the husband and wife in to the field and taking their pictures, to grant them a land certificate that contains both the picture of a husband and a wife, so that the problem cannot happen again". The administrators acknowledge the complaint by the community but they are not really concerned to solve that problem as they consider it is over exaggerated. And there is also a sense that the administrators, who are government employees, are also part of the community.

The basic concern, however, is that as the Karrayu pastoralists settle at different places in the district, there is an excess of land that will be left according to the plan. The local elders are well aware of this issue and they are blaming the authorities that they are intending to settle other people from highland as well as their neighboring pastoralists on their land. If this happens there will be a big chaos on the Karrayuland. On the other hand, one government official revealed on this by saying "it is a rumor that some individuals create to create conflict between Karrayu and their neighbors and create instability in our area".

B. Water usage

As the irrigation is based on the big Awash River, there is no problem of shortage of water claimed by anybody. However, there are different problems so far observed on the irrigation canal. Figure 9 below indicates the view of the main irrigation canal underlain by plastic coverage. One of the problems or challenges is the misuse of the plastics underlying the canal, to protect the irrigation water not to sink to the ground. The pastoralists detach the plastic underlying for the earthing purpose of the water to protect leakage to the ground. They use it for the roofs of their houses and as bed sheet to sleep over it and cover their ground floor.

Figure 9. Picture taken at Qararri, indicating the view of the main irrigation canal, underlain by plastic coverage.

Another problem raised by the informants is that there are people who are taking the pipes of the water used to divert from the main canal to different directions for irrigation purpose. The local authorities confirmed that this problem is happening and they controlled some of the thieves and still investigating for the others. However, one of my key informants said that *"we*

have heard from the local authorities that there are thieves taking the pipes of water. The next day we heard again from the authorities that the thieves are captured. We do not know what is happening." This shows that, on the one hand, the community are not interested to the irrigation, and on the other hand, there is no consultation made with the community and they are not convinced and not ready to protect the irrigation. This misuse of water is also suspected as one causes of the alarming increase of Lake Basaka since the two years. It is inevitable that the water leaks to the ground flows directly to Lake Basaka, as the lake is in a low laying area. Hence, everything that people take in response to climate change and variability has its own consequences, if not properly planned and done.

C. Market

Market in pastoral areas in Ethiopia is a general problem. For instance a research by Davies and Bennett (2007) reveals that: *"there is only one formal market and three informal markets in the Afar region of Ethiopia, to serve the population of one big region. This limited number of market expose the community visiting the markets a roundtrip in excess of 300 km which limits the frequency of visits. A number of factors were reported to inhibit the sale of livestock and compromise Afar interests in the marketplace, and most of these are related to distance including: weakening or loss of stock in transit, costs of keeping transport camels, labour demands of marketing, lack of amenities for reconditioning the stock in the markets (water and fodder), high cost of subsistence whilst in the marketplace, and the impossibility of return to the point of origin if stock is unsold."*

And, in Borana region of Ethiopia which covers is an area of 6 000 ha, there was no market until 2009. Currently, there are three markets working in the Borana Zone, serving the Borana pastoralists. Similarly, there is a plan to form two markets officially in the Karrayu, as most of the key informants informed me. Thus, in Karrayu pastoralist community, there is no officially recognized market. However, there is a Thursday market in Matahara town, where people can buy very minor things like spices, and cereals, as well as sale their goats and sheep, and sometimes camel. Hence, lack of market is a big challenge constraining their adaptive capacity.

Coming back to the irrigation outputs in the Karrayuland, the producers are not really taking their produce to the market. It is the consumer that is coming to the produce where the output is located. In between the producers (settled Karrayu households) and consumers (from elsewhere), there are other advantageous groups. These are named as "*Dallaalaa*", literally translated as brokers. The brokers come to the karrayuland on the irrigation field and

negotiate with the producers. As i talked to one of the producers, informally on the field, he *said "..., they tell us to sale them in cheap prices. If I say no, they say... look, all these are onion. If you do not sale I will go to that man".* In the mean while, there is a competition to sell the produce between the producers, as onions cannot stay long periods like other cereals, the brokers are enjoying cheap prices from the community. The good thing is that, the onion is a good quality onion as people said.

It is the work done by ambition, as one of my key informants from government official told me, just to demonstrate and convince the Karrayu community that the irrigation is for them. The government knows that there is lack of infrastructure, like market and road, as most of the irrigation places are inaccessible. This informant said, "once, the community accepted irrigation and settled at one place it is easy for us to provide the rest of infrastructure". This reveals that the government is setting a pre-requisite, in case of Karrayu pastoralists - settlement, for providing social services for his people.

D. Production

Currently, the settled household group of the Karrayu pastoralists are producing (cultivating) onion, and maize (very small extent). However, the majority of the product is onion. This homogenous production, as all of my key informants (from the community and government officials) and focus group participants agreed, is a problem. This problem is happened may be, as one of my key informants from the government office, said due to the fact that "there is no work done for what kind of crops the land is suitable for", or the land is mainly highly suitable for onion. However, people are also cultivating maize. Hence, it is not clear whether the objective of the irrigation is to feed the people by producing cereal crops or to make people dependent on cash crop by producing root crops like onion for market.

E. Household division

The ongoing irrigation project in the Karrayuland is planned to massively shift the pastoralists to agro-pastoralists. It involves settlement of part of the household, and has serious gender implications, as discussed above. It modifies significantly the gender division of labour within the family, imposing additional tasks on the women who head the part of the household that settles and actively engaged on the ongoing irrigation projects. Men, especially the youth, are engaged on moving with camels and cattle in search of pasture and browsing plants.

F. Knowledge or awareness

Rain-fed agriculture, which is farming in a traditional way, is not a simple activity for pastoralists, let alone irrigation. Irrigation is not an ordinary activity that everyone, like pastoralists who have not experienced with crop farming, can exercise easily. It needs knowledge. The Karrayu pastoralists who have very little experience in farming are now on the edge of using irrigation either for survival or to increase their wellbeing in response to climate variability and change. The government officials argue that the government employed DA's (development agents) to all PA's (pastoral associations) to train the pastoralists how to cultivate and use irrigation. On the other hand, the community argue that the DA's are not training the people because, the day they reach here they leave here or they go to the town and do not come back again. As the DA's are not from the community or local people, rather from the central highland farming people, they do not resist the harsh environment of the area and in addition to this they do not know the culture of the community. This created a gap between what is planned and implemented, as the DA's always report that they trained the community.

6.1.2 Resettlement

Resettlement is another programme that the government is pushing to sedenterize Karrayu pastoralists, as indicated in Figure 8 above that shows irrigation scheme and the settlement plan of the government for the Karrayu pastoralists. Either due to the problem they faced because of restriction of mobility and expansion of opportunistic farming or due to government policy which favors pastoralists to sedenterize, the Karrayu pastoralists are now started sedenterizing at different places in their districts. Markakis (2004) writes that sedenterization in East African pastoralist areas takes several forms. The first one is to remain in the region and became increasingly dependent on cultivation while retaining a depleted land; while the other is to migrate to a neighboring district where land is available and to take up cultivation. In case of my study, the driving force for the Karrayu pastoralists to settle is the government policy that initiates pastoralists to settle in order to get social services, and the irrigation project that the government is using as a means (tool) to convince pastoralists for sedenterization and use of irrigation.

This push towards sedenterization has an impact on women. In Karrayu community, men have limited culture of work on farming, as explained above under the section of diversification. They are basically responsible to defend their boundary and keep the wellbeing of their livestock; while women are responsible for the wellbeing of the family.

Hence, sedenterization added another burden on women like engaging on irrigation activities, charcoal making, and fire wood collection to keep their family wellbeing.

6.1.3 Productive Safety Net Program (PSNP)

In response to the historical food insecurity in the country, and specifically "informed by the large-scale food crisis that hit Ethiopia during the course of 2002 and 2003" (Gebru *et al*. 2009), the current government acknowledged that food crisis in Ethiopia was mainly a development problem: an inability to manage the risks associated with the erratic weather experienced by Ethiopia. In 2005, the government of Ethiopia, with the support of a wide range of donors, such as World Bank, USAID, CRDA, and WFP, developed PSNP, which is grounded in a principle of social protection (Gebru *et al*. 2009, Slater *et al.* 2009, WFP 2010). It is a programme providing six months of support on an annual basis to households in designated food insecure districts, with the objectives of reducing household vulnerability, the improvements of household and community resilience to shocks and breaking the cycles of dependence on food aid, by "providing transfers to the food-insecure population in chronically food insecure *woredas* [districts] in a way that prevents asset depletion at the household level and creates assets at the community level" (Government of Ethiopia, 2006). As a result, 80 percent of beneficiaries are included in public works programmes (through labour-intensive public works in soil and water conservation, water harvesting, small-scale irrigation, reforestation, rural infrastructure development, horticultural development and water supply schemes), and the remaining 20 percent – those unable to work, orphans, and pregnant and lactating women – receive direct support or unconditional transfers. The number of beneficiaries increased from 5 million in 2005 to 7.5 million in 2009, in 290 of 710 districts of the country (Gebru *et al*. 2009, WFP 2010), and the programme continues until 2014.

PSNP, being new social protection concept for rural people, is even more new to the pastoralists. Although the PSNP is now expanding into pastoralist areas, like karrayu pastoralists in Fantalle district, its implementation is often hampered by a range of issues. As the country's rural policy design has always been made its center the highland farming community, there are inconsistencies and problems in implementing even the public work programmes, which are preconditions to get the benefit from the PSNP, in pastoral communities. Hence, the PSNP remains under the pilot programme and food requirements will be addressed under the relief system.

Fantalle district is one of the beneficiaries of PSNP. As focus gruoup participants revealed, the programme supports those who are selected to benefit from it, especially women

and the elderly. It is indicated that the programme can help the beneficiaries for consumption, for school fees and medical expenses. As key informants from the government officials reveal, the Fantalle district is "going to graduate" very soon, which means the district is to be a food secure district. As one informant explained *"in history, the Karrayu community have never practiced going for the government work. As a tradition, the Karrayu men always use stick tooth brush and go after cattle and camel. There was no day that they went out with axe to make drainage to protect the soil and water in conservation mechanism. But nowadays, due to the problem facing them due to this climate variability and change, and as well as due to their willingness to be part of the solution, and government focus on conservation of the environment, they are participating in public works, especially in soil and water conservation. Hence, they are also getting the benefit from PSNP".*

As I understood from the fieldwork, the PSNP contributed a lot in consumption and protecting community and household assets. Protection of household and community assets reduces vulnerability to the impacts of climate variability and change. However, the participants in the focus group revealed that it created a sense of division within the community. As one informant said "we all are poor", but the authorities select only few people. Knowingly or unknowingly, the programme faced two challenges. On the on hand, it created exclusion and inclusion problem within the community. On the other hand, it created some households to completely depend on the programme as they spend a large amount of time in public works. Moreover, since the culture of work designed for the farmers in highland areas is little in pastoralist areas, the pre-condition of the programme also restricted the pastoralists from taking the advantage.

6.2 Non Governmental Organizations (NGOs) responses

The role NGOs play in development activity in general, and specifically in developing the adaptive capacity of the community to the changing environmental conditions, is very important especially for developing countries like Ethiopia. Evidences by different authors (Amsalu and Adem 2009, Virtanen and Gemechu 2011) indicate that NGOs were/are important development partners in Ethiopia on local development and emergency activities through social service provision, awareness creation, conflict management and resolution, livelihood diversification, and food relief provision. The report of Ethiopian Ministry of Foreign Affairs (MFA) in 2009 indicates that there are 14 International NGOs (INGOs) that are crucial service providers in relief and development activities. The document is also reveal that due to the decrease in emergency relief, the government has also suggested that INGOs to

participate in health, education, food security and water supply provision under close government guidance (MFA 2009).

From 2009 onwards, the government has taken measures to limit the scope of operation of the civil service organizations (CSOs), and specially NGOs (both local and international). Despite strong and repeated critical statements and appeals by both CSOs and donors, in 2009 the government approved a new CSO law that bans domestic NGOs from receiving more than 10 percent of their income from foreign sources, otherwise considered 'foreign organizations,' (Vintanen and Gemechu 2011) and, like INGOs, are not allowed to participate in any activity deemed political by the government, like empowerment, women's right, advocacy work, and democratization. By doing this, the government confines NGO activity strictly to service delivery under its supervision. In relation to this, my informants are angrily expressed their feeling that the government blocked the NGOs from supporting them, and one of the informant reveal the situation as follows: *"I don't want to say anything because it was so bad that the government say do not support the people /community. The NGOs are willing to help us and they helped us a lot until last two years, and we benefited a lot. Now, the government restricted their work in the community. The government authorities tell us that, we will get support from NGOs through the government officials.....The NGOs tell us that they gave support through the government and we do not know where that support goes. The government officials misuse the budget of the government, let alone the support from NGO, and no one can ask them."*

It is may be due to this, as understood from the field, that GOAL International closed its sub-office at Fantalle district. Similarly, NIIM, a local NGO is also closed its office, but reopened in 2011. However, there is one that is committed to the Karrayu community under all this circumstances, Gudina Tumsa Foundation (GTF). GTF is established in Fantalle district at *Dheebitti* in 1992. By recognizing the difficult situation in the area, NGOs are operating by focusing on many thematic areas in order to support vulnerable communities, enhance their adaptive capacity and invest in preventive activities. For instance, from the date of its establishment, GTF is involved in different development activities in Fantalle district. In the following section, I discuss the roles played by NGOs, mostly by GTF as other NGOs-like NIIM and RIRA are very young in the area, even though they are active currently.

6.2.1 Provision of social services

Social services are amongst the poorly developed infrastructures in the study area. Most NGOs are engaged in full filling this gap, in order to develop awareness and reduce the

impact caused by climate variability and change. Some NGOs work in the provision of education and health services. For instance, primary and secondary schools named as "*Dandii Gudina* Primary school" and "*Dandii Gudina* Secondary school" in the study area are indications of the footprints of NGOs in provision of social services. In addition to these formal education services, NGOs are also working on adult education which includes issues on HIV/AIDS, diversification, resource management, and destocking. As observed in the fieldwork, the role of NGOs in Karrayu pastoral community in provision of social services is basically on education and health services, provision of grinding mills, and relief support. Most importantly, being aware of the movement of Karrayu pastoralists, GTF has built a dormitory for both male and female students and especial hostels (only for female students). This is an important contribution for the futurity of the community, as students will not interrupt the studies while their parents move from one place to another place.

6.2.2 Awareness creation and integrated activities

Awareness creation in issues like diversification, girl's education, afforestation and rangeland management are very important in developing the adaptive capacity of the community. These are the most common issues that the NGOs work on in Fantalle district of Karrayu pastoralists' community. As an interview with GTF manager indicates, every work they are doing in Fantalle district is integrated. Most of the time, the awareness creation in the community is done by students who are at high school level (grade 9 and 10) and outstanding from their class. In addition, educated adults (with informal education by GTF) take part to help the students. All these are facilitated by the GTF. For instance, in the rangeland management system, the primary objective is to protect pasture or *Kaloo* for the stress period either on ground as it is or by cutting and accumulating or piling up together, which later to be distributed for the community for free. The distribution is done by using horse cart; the horse of the horse cart is grazing in the protected pasture. This NGO also does shoat and beef fattening in the pasture. Communities are motivated by the NGO to form association and use pasture, do beef and shoat fattening. Similarly, they are also working on reafforstation of the area by growing different plant species at their own nursery sites, and distributing for people to grow at their places. In the focus group discussions, participants have appreciated the role that some NGOs play to support them.

In order to increase the source of income of the community, some NGOs are also engaged in diversification. For instance, after giving training on poultry production for women, they distribute poultry for the participants for free. In addition to all the above

mentioned activities, NGOs are also involved in other activities which include provision of food relief and non-food items, temporary shelter, and livestock feed during drought.

6.2.3 Challenges to NGOs

As interviews and focus group discussions reveal, NGOs have contributed a lot in developing the adaptive capacity of the Karrayu community. They created different opportunities to reduce the vulnerability of the community to climate variability starting from service provision, training on diversification (like shoat and beef fattening, poultry production) with incentives, rangeland management (especially focus on pasture), and afforstation (by distributing plant species from their own nursery sites). In addition, they trained the community in taking part in trade, especially in relation to shoat and beef fattening.

However, there are a lot of challenges that NGOs are facing. It is clear that the challenges are from the suspicion that the government authorities have with NGOs in general with their work on human rights, empowerment and so on. As the following quote indicates, there is a big misunderstanding and suspicion on the works of NGOs.

> "...., there are people or individuals who do not want to see when we help and support Karrayu community. These individuals create problems by going between us and the government, and tell wrong things to the officials so that our projects will phase out soon; or blocked by the government. There are also other government officials who want to divert the budget to their pocket by creating different problems. These are all due to ignorance and greedy nature of individuals. ..... People are willing to get training and support. To the surprise, there is time when the government officials stopped us from training on early warning and dispersed the people from the meeting we are conducting. We give training for DAs of the PA and the government officials gave warning to the DAs not to take part in the training given by NGOs. They accused of them as they are going for training in support of daily allowance leaving the government work while government is paying them monthly salary."

To summarize this chapter, this second section of analysis indicates that both government institutions and nongovernmental organizations are actively participating in taking measures against the vulnerability of the community to climate variability and change, even though the roles the government institution is playing is at large scale compared to the nongovernmental organizations. Based on the Institution, Adaptation and Livelihood framework, the analysis indicates that the interventions by the government and nongovernmental organizations are

shaping the adaptation strategies of the community. This framework clearly indicates that how the roles of the government, as discussed earlier, in response to climate variability and change is forcing the Karrayu pastoralists in changing their livelihood system at the cost of their traditional institution (the *Gadaa* system - by which they used to govern and help each other) to protect their land through settlement. The framework is also indicates that how the government is mediating external interventions, on the one hand by using funds from international donors by the name of Climate Change National Adaptation Programme of Action and Productive Safety Net Programme, and on the other hand controlling and limiting the scope of local NGOs participation to service provision under its supervision.

The answer to the second research question which says *"what are the roles of government institutions and nongovernmental organizations in developing or destroying the adaptive capacity of the Karrayu pastoralists' community and how their involvement is affected the community?",* is that the intervention by government institution in response to develop the adaptive capacity of the Karrayu pastoralists' community to climate variability and change is, on the one hand, destroying the traditional coping and adaptation strategies of the community, and on the other hand developing the adaptive capacity of the community to a "new" livelihood system to the community, which is agro-pastoralism based on irrigation. Similarly, the nongovernmental organizations are playing a role in transforming the society from pastoralism to agro-pastoralism by developing their adaptive capacity through training on diversification activities, integrated rangeland management, awareness creation, relief provision and provision of social services. As discussed earlier, these interventions have affected the community in terms of weakening their traditional support system, destroying their culture, and weakening their traditional institution (*Gadaa system*).

7. Conclusions

The Karrayu pastoralists' community in the arid and semi-arid lowland of the Upper Awash Valley of Ethiopia is at the center of this research. The views, thoughts, insights, and experiences of the key informants and focus group discussions participants of the research from the community are presented and analyzed.

This thesis has explored the different factors that aggravate the vulnerability of the Karrayu pastoralists to climate variability and indicated how their vulnerability is changing overtime. The thesis has also investigated how the adaptation mechanisms of community are changing, and it explored the roles the government institution and nongovernmental organizations are playing in developing or destroying the adaptive capacity of the Karrayu pastoralists' community to climate variability and change, and showed how these organizations are trying to transform the community to a different livelihood system. In this chapter, I will synthesize and conclude the results of the two analyses by drawing out three key findings. I will then consider their implications, as well as the implications of this research for policy makers.

7.1 Findings

1. ***Vulnerability of the Karrayu pastoralist community to climate variability and change is aggravated by multiple stressors like social factors, government policy and the underlying environmental conditions.***

As discussed in the analysis sections, more than the erratic, short and heavy rainfall that leads to drought, the community is pointing their fingers to factors such as Matahara sugarcane plantation, Abadir fruit and vegetation farm, Nura-Hera fruit and vegetation farm, and Awash National Park that are causing the community vulnerable to climate variability and change by expropriating their key resources (pasture and water) along the Awash river and taking their dry season grazing land, squeezing (contracting) their grazing land and restricting their mobility; and hence increasing population pressure on the available grazing land. This decrease in pasture availability has made a profound effect on their livestock and made the Karrayu pastoralists more exposed and vulnerable to climate variability by affecting their food consumption and their source of income.

Another important issue in relation to the factors that make the pastoralists vulnerable to climate variability and change is the expansion of Lake Basaka and encroachment of bush, which the community sadly explains. The bad thing is both lake Basaka and encroaching bushes are useless. Both people and their animals cannot drink the water of the lake because

of its high salt and fluoride content. The community explains that where ever Basaka reaches no tree or grass can survive. Similarly, the invasive bushes have affected the Karrayu community, not only by expanding over the available grazing lands and avoiding palatable and nutritious indigenous grass and plant species, but also they are poisonous and kill their livestock if they are consumed.

The search for pasture has forced the pastoralists to move to their bordering neighbours in order to get the pasture during the dry season, which has in turn aggravated the traditional conflict with their neighbours over dry season grazing land. The conflict has cost the pastoralists their lives and the lives of their livestock, in addition to making most of the lands bordering their neighbours as un grazed or "no man's land" due to fear of violent conflict and livestock raid, which could have helped the pastoralists to adapt to climate variability if grazed peacefully.

2. ***The adaptation mechanisms the Karrayu pastoralists have used to climate variability in the past times have become insufficient to sustain them and are changing gradually.***

Their traditional adaptation system through mobility by moving between dry season and wet season grazing land has been restricted through expropriation of their dry season grazing land for other land use types by government and private companies, as discussed in the analysis section. The lose of their typical dry season grazing land has limited their adaptation strategy to climate variability and change and forced them to diversify their livestock in relation to the available grazing land and resources, and change the nature of their mobility. To some extent, mobility still exists although the nature of mobility differs from the one they used in the past times. As discussed in the analysis, the camel households are still mobile, where as the movement of the cattle households are limited. As discussed above due to lose of their typical dry season grazing land, they have shifted their livestock composition from which they are known for it as cattle pastoralists to camel and goat.

In addition to this shifting of livestock composition from cattle to camel and goat, their perception towards farming has been changing. They have started "opportunistic" farming which is dependent on unreliable rainfall condition, and other income generating activities (like fire wood sales, charcoal making and petty trade). Their traditional milk and meat consumption is decreasing due to decrease in cattle productivity and poor quality, and it is being compensated by crop consumption which is basically obtained from a far market by selling their goats and sheep, and by "opportunistic" farming. In addition, the increase in issue

of income diversification, compared to the past is due to increase in expenses influenced by modernization, as discussed in the analysis section.

Similarly, due to the weakening of their traditional institution, the *Gadaa* system, their traditional mutual support system has weakened. As discussed in the analysis section, mutual support system of the Karrayu pastoralists was not only an adaptation strategy but also a means of building social coherence and sense of belongingness, "ours". The weakening of this tradition through interventions by government and nongovernmental organizations, as well as the introduction of "modernization" like sending children to school, paying school fees, expense for health services, and buying modern cloths (like trousers, jackets, and shirts) leaving their traditional sheaves (locally called "*Marto"*) has produced sense of individualism in the community and weakening of sense of communality, hence weakening and destroying one of their adaptation mechanism to climate variability and change.

In addition, the loss of the natural support system they used to get in the past from their environment, which is fruits of plants, is affected their source of food and increased their vulnerability to climate variability and change. Fruits of plants were use as food for humans and livestock in times of drought and shortage of milk and meat. These fruits of plants were used to be collected from riverine forests and elsewhere from their land. However, due to the expropriation of the riverine forest areas for irrigation activities, riverine forests are not giving their usual support for the community.

In addition to the adaptation strategies mentioned above such as shifting livestock composition, expansion of opportunistic farming, and income diversification, different new forms of adaptation are emerging on karrayuland. These are irrigation and household division. While irrigation is a government response for the community as part of Climate Change National Adaptation Programme of Action, household division is designed or adopted by the community themselves in response to climate variability and change, as well as due to lack of grazing land and introduction of irrigation. An important development in the household division as an adaptation strategy is that a single household is divided in two: as a camel pastoralist household and settled household; where the camel pastoralist household are mainly responsible to keep a herd of camel and few cattle at long distances from the settled household and make sure that their livestock graze very well; whereas the settled households are engaged on irrigation and other income generating activities as mentioned above.

3. ***The third finding is that, the external interventions in the Karrayu pastoralists area in order to develop the adaptive capacity of the community to climate variability and change is increasing.***

The most important external intervention found in the Karrayu pastoralists' community is the government intervention. The government intervention is, however, not to make the Karrayu pastoralists to continue with pastoralism as an adaptation strategy to climate variability, rather to transform the pastoralists to a different livelihood system, agriculturalists (or farmers). As discussed in the analysis section, the past regimes of Ethiopian government had expropriated the Karrayu land for different land uses, by marginalizing the pastoralists socially, politically, and economically. Even though the land expropriation is continuing at an alarming rate in the current government as well, there are some activities the current government is doing for the pastoralists as well. In addition to the usual response of emergency as the past regimes, the current government is conducting a large scale irrigation project which is part of Climate Change National Adaptation Programme of Action (NAPA) "for the community", to provide the community another livelihood option that is "sustainable" to climate variability so that the pastoralists can settle and use irrigation to practice farming.

The government is actively engaged in land sub-division and titling of the communal grazing land for the pastoralists so that they can settle and use it for irrigation privately. Even though this is a very recent activity started since 2009, there are some indications at few pastoralists associations (PAs) that the Karrayu pastoralists have started producing onion using irrigation. As discussed in the analysis section, this land distribution has faced challenges like distributing the land for the government employees, where a single government employee gets land at different PAs and the community blaming that "the government employees are taking our land in front of our eyes". In places where the irrigation is started, there are different challenges with regard to its implementation like removing the plastic sheet covering the canal of the water from sinking to the ground, removing and destroying pipes taking to different irrigation fields from the main canal, lack of infrastructure in irrigation areas such as market and road, lack of knowledge (or experience) to practice farming, and homogenous production.

Another intervention by the government, also related to the irrigation activity, is its resettlement programme of pastoralists. The government, on the one hand, claims the resettlement programme is voluntary, and on the other hand dictates through its local administrators that the pastoralists only get social services like health, education, and clean

water if they settle at one place. In addition, to get land for irrigation the pastoralists have to agree that they will settle and take up farming.

Another external intervention in the study area in order to develop the adaptive capacity of the community to climate variability and change is the role nongovernmental organizations play. Since the scope of their involvement in the society is limited (or confined) by the government, most of the roles of nongovernmental organization are limited to social service provision like education and health services. In addition they are actively engaged in creating awareness on livelihood diversification, girl's education, resource management, destocking and food relief provision.

7.2 Implications

The implications of these findings show that the Karrayu pastoralist's community is the community living under the continuous threat from several angles for several years that made them more vulnerable to climate variability and change. However, the community is also responding proactively to the challenges they are facing from time to time as the challenges are also changing from time to time. The culture of the community under their traditional institution is at the center of any action they take in response to external threat and in guidance towards their adaptation strategies to climate variability.

The government policy that restricted the movement of pastoralists through different development interventions by taking their dry season grazing land has contributed a lot to the vulnerability of pastoralists. The community is blaming these interventions more than the rainfall variability that makes them vulnerable to drought. I argue that the run to expropriate productive resources of the Karrayu pastoralist's dry season grazing land along the Awash river is at most the main factor causing vulnerability to climate variability and change. For instance, areas like Matahara sugarcane plantation, Abadir fruit and vegetation farm, Nura-Hera fruit and vegetation farm, and Awash National Park were used as reserve pasture zones only for dry season grazing period and during extreme drought conditions. This shows that the change in land use system of the area through the external intervention has a significant impact on increasing their vulnerability and decreasing their adaptive capacity to climate variability and change.

This implies that the irrigation potential of Awash river has attracted attention from the Ethiopian government (State) as well as from commercial interests since 1960s when the Matahara sugar factory established on the karrayuland. As discussed in the analysis section,

successive government regimes have dispossessed the right of landownership of the pastoralists; for instance, the 1955 constitution of Ethiopia of Haile Sillasie stating that *all property not held and possessed in the name of any person, natural or judicial, including all grazing lands are State Domain*, and the land reform of 1975 of Derg regime nationalized all land. The 1995 constitution of the current government modified the system by stating, on the one hand, pastoralists have the right to free land for grazing and cultivation as well as the right not to be displaced from their own land, and on the other hand the same constitution clearly states grazing lands are not held or possessed individually and hence belong to the government. Hence, the area inhabited by the Karrayu has become a focal point of competing strategic interest between the state and the community. On the one hand, the irrigation potential of the area has attracted large investments in commercial farms that may help to boost national food production and generate revenues; on the other, the irrigated areas serve as important dry season pastures for local pastoralists, through which they used to adapt to the variable impact of climate.

I argue that although the geographical location of the Karrayu pastoralists has contributed a significant impact in making the Karrayu pastoralists more vulnerable to climate variability and change, it has been the expropriation of their key resources (pasture and water) on which they base their living that has increased vulnerability. In addition to the government expropriation along the Awash river as discussed above, their immediate neighborhood with agriculturalists (who are dependent on farming) and agro pastoralists (who are dependent both on farming and livestock) has contributed a significant impact in expropriating their resources and then limiting their adaptive capacity through limiting their movement and creating conflict of interest over land use. They are also in conflict over resource use with pastoralists. The government policy favors marginal farmers to cultivate the grazing land as its constitution says "pastoralists have the right to free land for grazing, but the land that is not covered by crops under individuals belong to the state". This implies the systematic marginalization of pastoralists by giving political protection for the farmers and exclusion of the pastoralists. The conflict with these pastoralists and agro-pastoralists is getting more intense and intense costing the lives of the people and their resources and leaving most of the grazing lands as "no man's land" due to fear of violent conflict and livestock raid, otherwise it could have helped them to increase their adaptive capacity to climate variability if grazed peacefully.

All those forces (factors) that squeeze (or contract) the grazing land of the Karrayu pastoralists, as discussed in the finding, resulted in degradation and overgrazing due to

population pressure on the available grazing land. This has made the grazing land exposed to water erosion (due to the variable, intense and heavy rainfall) and wind erosion. The implication is that, as the soil and seeds of grasses are removed by these erosion processes, there is no enough pasture to grow and support the livestock of the community, hence leading to low quality of livestock and shortage of milk, meat and milk products, as discussed in the finding. Hence, I argue that issues that deal with the vulnerability and adaptive capacity of the community should take in to consideration the local context in which the community are taking their daily lives.

From the above analysis and findings, I conclude that there may be no way back for Karrayu pastoralists community to pastoralism. This can be highlighted by the adaptation mechanism the community is taking. As I discussed in my finding, the adaptation system that they have used in the past times have become insufficient to sustain the Karrayu pastoralists and is changing gradually. All forms of the current adaptation strategy of the pastoralists indicate that pastoralism is declining and other forms of adaptation strategy like shifting livestock composition from cattle to camel and goat, opportunistic farming, household division and irrigation are the way away from pastoralism as discussed in detail in analysis section. The implication of this finding is that, with changing in adaptation system to climate variability and change, the traditional communal landownership of the community, their culture and way of living is also changing.

The expansion of opportunistic farming is at the cost of the communal land ownership, leading to private ownership. Similarly, the struggle for survival forced the pastoralists to divide their household in to settled and mobile, where both have their own responsibility as discussed in the analysis section. These has a significant impact in weakening the traditional cultural institution of the community, the *Gadaa* system, under which the community is used to govern and support each other, which is much more tied to pastoralism and communal ownership of land. As discussed in the analysis, the Karrayu pastoralists had a strong mutual support system in the past. However, it is now a tale or story, as their mutual support system are constrained by the escalation of poverty and conflicts, decrease in number of livestock a household have, increase in the number of a households who lose their livestock due to conflict, drought and disease, individualistic development in the people (contrary to their tradition) due to "modernization", weakening of *Gadaa* system which used to govern the people under one umbrella, unwillingness of individuals to respect the rules and regulations of the traditional institution and going for the ruling government.

The strategy the community adapting is driving them to "modernity" like considering money as wealth status rather than counting the number of livestock, which can be evidenced from their view that "goat and sheep are like money in pocket", diversifying their consumption by "opportunistic" farming which is competitive to pastoralism, and engaging oneself on petty trades like charcoal making and selling fire woods. Even though it added burden on women, the household division strategy is contributing a lot in transforming the Karrayu pastoralists from pastoralism to agro pastoralism and forced the community to look for other means of income as the milk of camel is very far from them to sustain the household. These proactive reactions of the community to climate variability and change in order to develop their adaptive capacity have to be supported in well organized manner to reduce their vulnerability and increase their adaptive capacity.

As indicated in the finding, the intervention by the current government in order to develop the adaptive capacity of the community to climate variability and change by irrigation is increasing. The motive behind the government's large scale irrigation project is control of people movement through sedenterization using irrigation as a means and the need to change (of course changing) the communal land ownership of the Karrayu pastoralists to private land ownership by sub-dividing and titling the grazing land for pastoralists to cultivate using irrigation. As I argue above as there is no way to continue with pastoralism for the Karrayu pastoralists, I consider this response of the government contribute a positive impact for the Karrayu pastoralists in their struggle for survival as well as in increasing their adaptive capacity to climate variability and change.

The finding also shows that the Karrayu pastoralists have to settle to get the land for cultivation using irrigation and to get social services. The pastoralists are also willing to settle because they are already aware of the problem that if they do not settle and take the land for cultivation, they know that people from other place will come and settle over their land because that irrigation water cannot be lost simply on the ground. This indicates the government's response to develop the adaptive capacity of the Karrayu pastoralists through its Climate Change National Adaptation Programme of Action has created a sense of fear in community in their ownership of the land that motivates them to protect their own land from the "others" by any means, in which their household division mechanism to adapt to climate variability and change is the best fit to implement this as some of the household members get land through settlement and the youth boys protect their grazing land as discussed in the analysis section. Hence, I argue that, on the one hand, the government is destroying pastoralism and the way to pastoralism in a sense that it is not adaptive to climate variability

and change and cannot sustain the community, and on the other hand transforming the pastoralists to farmers in its own interest in order to reduce their vulnerability and increase their adaptive capacity to climate variability and change.

Similarly, the productive safety net programme of the government has contributed a lot in developing the adaptive capacity of the community by protecting and building community and household assets, covering expenses (like school fees and health care services), and smoothening consumption.

Although it is at a small scale, the response (or work done) by NGOs in order to reduce the vulnerability and develop the adaptive capacity of the community to climate variability and change is more practical and related to livelihood diversification. All interventions taken by NGOs are intended to diversify the livelihood of pastoralists through practical demonstrations such as beef fattening, shoat fattening, poultry production, destocking, and resource management (like fencing pasture and accumulating for later use during stress time) through training and education, and giving support and free services. Provision of food relief and non-food items during stress time is also their main activity.

In general, this research shows that the vulnerability of the Karrayu pastoralists to climate variability is aggravated by multiple stressors. And all responses by the government and NGOs, and some responses of the community itself indicate that pastoralism is not the way to adapt to climate variability and change for the Karrayu pastoralist community. As I argued above, there is no way to continue with pastoralism for the Karrayu community. It is almost impossible to provide the Karrayu pastoralists with their grazing land, especially the dry season grazing land by removing all those commercial farms along the Awash river so that the Karrayu community will get back their dry season grazing land. On top of this, due to climate change and variability the amount of rainfall is decreasing, it is becoming more erratic, small, and heavy leading to soil erosion rather than sustaining the grasses and edible plants.

Hence, the way forward for the community in order to survive and adapt to climate variability and change is agro-pastoralism by using mainly irrigation. The great opportunity for this is the existence of the Awash river that crosses the district and very flat land of the Karrayu. However, there are different social challenges for the community in order to achieve this. In the first place, the Karrayu pastoralist community is the people of culture, as the elders call "a Karrayu cannot see himself outside his culture". And their culture is much more tied to pastoralism. This implies that all efforts to develop the adaptive capacity of the community to climate variability and change outside pastoralism have a big negative impact on their culture.

As discussed in the analysis section, they need large space for all clans to come together and celebrate their cultural ceremonies, a place that accommodates their livestock and community for some time. Hence, land distribution for private farming and expropriation for other land use types by the government which restrict their movement and take some of their holy places where they used to celebrate and celebrating has to be taken in to consideration in the move to transform forward the Karrayu pastoralists so that they can adapt to climate variability and change.

Other challenges in transforming the Karrayu pastoralists to agro-pastoralism lie in the level of their awareness for cultivation. As discussed in the analysis and findings, the Karrayu community (especially men) have no experienced on cultivation. This requires an unreserved effort to educate the people both formally and informally, to develop their skills on cultivation, diversification options, providing information on weather conditions and developing the technologies for local officers to provide the reliable information on time for the community. As discussed in the analysis section, the government has employed development agents (DAs) for this purpose. However, as the DAs are not from the community and do not know the culture of the people and unable to adapt to the harsh environmental condition of the Karrayuland, this gap has still been unfulfilled as the DAs are not staying in the area and even not go to rural parts where the community lives. In this regard, the effort made by the local NGO has to be appreciated, and the government policy makers have to consider the local context of the environment and culture of the community in their policy design so that their intervention in order to develop the adaptive capacity of the community to climate variability and change by transforming them to agro-pastoralism may be fruitful.

Hence, I conclude by arguing that government policy makers and organizations can play a great role in enhancing both coping and adapting strategies of Karrayu pastoralists, as well as in shaping and reducing their vulnerability to climate variability and change; but the government and its officials have to consider their negative perceptions (that have an impact on designing policy) towards the pastoralists in general and the Karrayu pastoralists in particular by listening to them and giving them voices, so that development projects as well as other interventions in order to develop their adaptive capacity can be fruitful.

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Appendix

Semi-structured interview guides for key informant interviews and focus group discussions.

- What are the local characteristics of the climate in this area?
- What are the main livelihoods strategies of the community in this area? Has this changed over the past years?
- How important are climate conditions for these livelihood strategies?
- Can you describe any major climate related events which have happened recently? What was your experience of this? How was your household or the community affected?
- What are the main stresses (or difficulties) faced by community today? Are these stresses or difficulties changed over the past years? And how?
- What are the coping and adaptation strategies people put in place when facing climate related events?
- To what extent is the community able to anticipate and identify triggers for forthcoming changes in livelihoods?
- What are the formal & informal organizations/ institutions, rules & regulations, that either support or hinder local livelihoods in facing climate related impacts and changes? How do they interact with the community?
- What are the past and present external (governmental and NGOs) responses to climate variability and change and what are their impacts?
- What are the locally perceived existing opportunities and capacities to foster adaptation of the community to climate variability?
- What are the locally perceived existing barriers and obstacles to adaptation, and in which way do community members consider to overcome them?
- Do you think your livelihood situation will improve in the future, and why or why not? *(Only for community).*
- How does your organization interact with the community and what measures have been taken in order to develop the adaptive capacity of the community to climate variability or change? *(Only for government and nongovernment organizations).*